TRANSACTIONS

OF THE

AMERICAN ASSOCIATION OF GENITO-URINARY SURGEONS

VOLUME XII

NO MEETINGS OF THE

ASSOCIATION WERE HELD DURING

THE YEARS

1917 AND 1918

TRANSACTIONS

OF THE

AMERICAN ASSOCIATION OF GENITO-URINARY SURGEONS

Thirty-first Annual Meeting held at
Hotel Dennis, Atlantic City, N. J.

June 16th and 17th, 1919

Vol. XII

Published for the Association by
Williams & Wilkins Company
Baltimore Maryland

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Wounded in action near Soissons, France, July 18, 1918; died at Neuville, July 20, 1918.

WAR ACTIVITIES OF THE MEMBERS OF THE ASSOCIATION

Dr. Gardner W. Allen. Ship's Surgeon, United States Shipping Board; made one trip to France (August to October, 1918) on *S.S. Shoshone*, cargo transport

Dr. Wm. T. Belfield. Urologist, Medical Advisory Board, Chicago.

Dr. Horace Binney. Lieutenant Colonel, M. C., U. S. A.; U. S. A. Base Hospital No. 5.

Dr. W. F. Braasch. Member of sub-committee on standardization of instruments and hospital supplies; instructor in Officer's School of General Surgery, Mayo Clinic.

Dr. Geo. E. Brewer. Colonel, M. C., Consulting Surgeon, A. E. F., January to October 1918; Director Base Hospital No. 2, May, 1917 to January, 1918; assigned to B. E. F. at Etretat, France.

Dr. Robert C. Bryan. Major, M. R. C., Red Cross; "Medicen Chef" American Ambulance B., Jouelly, France, April to September 1916; Red Cross Commission to Roumania, 1917.

Dr. Hugh Cabot. R.A.M.C., M.G. Lieutenant Colonel; served with B. E. F. at No .22 General Hospital as Chief Surgeon and then as Commanding Officer.

Dr. J. Bayard Clark. Major M. C., U. S. A., from April 1917 to March 1919.

Dr. E. Granville Crabtree. Major, R. A. M. C., No. 22 General Hospital, France, Harvard Unit; Surgeon in charge of Surgical Division.

Dr. Arthur H. Crosbie. Major M. C., U. S. A., Commanding Officer U. S. General Hospital No. 22, Richmond, Va.

Dr. J. H. Cunningham. Contract Surgeon, U. S. A.; serving on Committee of five in charge of Genito-Urinary and Venereal Diseases of U. S. A.

Dr. Faxton E. Gardner. Captain, M. C., U. S. A., genito-urinary work.

Dr. James A. Gardner. Medical Advisory Board; Medical Section National Defense.

Dr. Charles L. Gibson. Major M. R. C.; Director U. S. A. Base Hospital No. 9, Chateauvoux, France.

Dr. Francis R. Hagner. Committee on Genito-Urinary Diseases, U. S. A.; Contract Surgeon.

Dr. H. McC. Johnson. Medical Advisory Board.

Dr. E. L. Keyes, Jr. Colonel, M. C.; Consultant in Urology, A. E. F., February to December, 1918, Director Base Hospital No. 1, May to September, 1917.

Dr. Herman L. Kretschmer. Captain, M. C., U. S. A.

Dr. Victor D. Lespinasse. Consulting Urologist to Medical Advisory Board; conducted the Department of Urology in Northwestern University and University of Illinois.

Dr. Bransford Lewis. Member of Medical Advisory Board; Volunteer Medical Service Corps.

Dr. Henry H. Morton. Member of Committee on Venereal Diseases, Office of Surgeon General, U. S. A., during period of war.

Dr. H. G. Mudd. Major, M. O., R. C. Council of National Defense, Medical Section, Chairman State Committee, Missouri.

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Dr. Alfred T. Osgood. Medical Advisory Board for Draft; teaching summer and winter; Professor Genito-Urinary Surgery, Bellevue Medical College.

Dr. Henry L. Sanford. Lieutenant Colonel, M. C., U. S. A.; Staff Surgeon U. S. Hospital No. 4; Urologist 42d Division, 1st Corps, 2d Army.

Dr. Louis E. Schmidt. Medical Advisory Board; Consulting Surgeon, Great Lakes Station.

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Dr. George Gilbert Smith. Captain, M. C., U. S. A.

Dr. A. R. Stevens. Major, M. C., U. S. A.; chiefly Base Hospital work; general surgery and Consulting Urologist.

Dr. G. H. Swinburne. Refused on account of age; admitted to V. M. R. C.

Dr. Paul Thorndike. Chairman, Boston Auxiliary Branch, Committee National Defense.

Dr. William Warren Townsend. Major, U. S. A.; Genito-Urinary Consultant, Port Embarkation, Hoboken, N. J.; service consisted in direction of genito-urinary service in embarkation hospitals.

Dr. George S. Whiteside. Lieutenant, U. S. N.; Passed Assistant Surgeon, June 8, 1917 to July 1, 1919.

Dr. Wm. N. Wishard. Committee National Council of Defense (Medical), Indianapolis Section; Committee State Council of Defense, Medical Section.

Dr. Hugh H. Young. Colonel M. C., U. S. A., D. S. M., Director of Division of Urology, A. E. F.; twenty-one months service in France in charge of urological work of A. E. F.

KILLED IN ACTION

Major Howard W. Beal. Attending Surgeon, Paris District, 1917; Surgeon 16th Engineers, Toul, 1918; Consulting Surgeon 1st Division, 1918; wounded in action near Soissons, France, July 18, 1918; died at Neville, July 20, 1918.

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THE AMERICAN ASSOCIATION OF GENITO-URINARY SURGEONS

FIRST DAY, JUNE 16, 1919

COLLOID ADENO CARCINOMA OF BLADDER

B. S. BARRINGER

From the Service of the Memorial Hospital, New York

The following case of colloid carcinoma of the bladder is unique, as far as a brief search of the literature reveals.

Both Dr. Ewing and I have been unable to find the report of any tumor that resembles it.

A man of forty-four years was first seen in June, 1918. He gave the history of pain in the left inguinal region for four years, and had noticed a growth in his lower abdomen for two years. This had been slowly growing larger. There was no marked frequency of urination, and no history of hematuria. He was a strong man and had worked up to date.

On physical examination I found a regular, firm suprapubic tumor extending to within 2 inches of the umbilicus. The tumor was flat to percussion and not fixed. It could be felt per rectum. The prostate was slightly enlarged and smooth. Cystoscopy showed a tumor as large as a small orange pressing in the top of the bladder, covered with normal mucous membrane except at one spot where the mucous membrane was thrown into folds and reddened.

Because we did not know the nature of this tumor, and because of the marked susceptibility of some tumors to the "radium pack," a pack of 1131 mc. (18,096 mc. hours) for sixteen hours was placed over the suprapubic mass and the growth watched for three months. Radium used in this way is heavily screened with lead and wood and placed some inches away from the skin. This method of radiation is quite different from that usually

used in e.g. carcinoma of the bladder where the radium is placed directly upon the tumor.

There were two practical reasons for treating the tumor with radium. First, the tumor might reduce in size and so be more easily operable; and second, if it came to operation the effect of

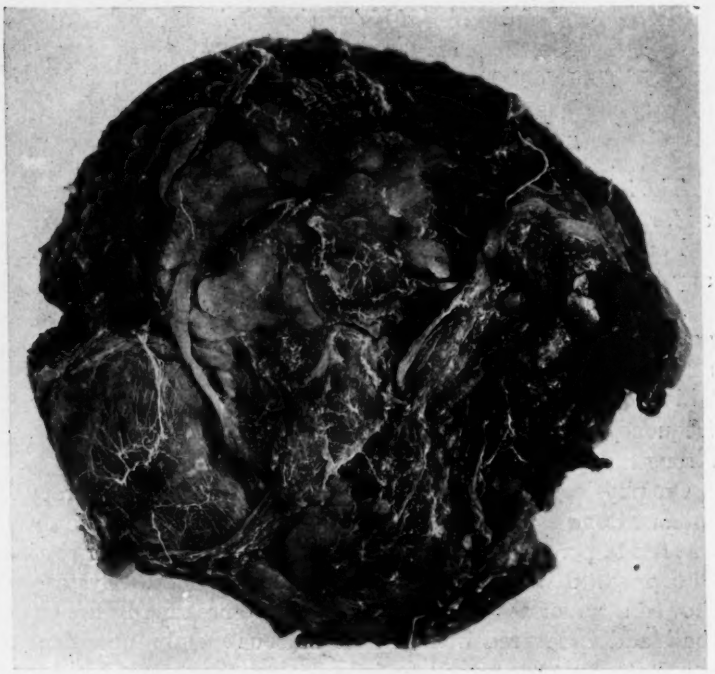

FIG. 1. COLLOID ADENO CARCINOMA OF BLADDER

the radium might be to reduce the malignancy of the tumor cells and so reduce the chance of implantation of active tumor cells at the time of operation. This sounds perhaps chimerical, but is, I believe, a decidedly practical consideration. For instance, in teratoma of the testicle if the growth has gone beyond the testicle our present viewpoint is that radium in the form of

a radium pack is quite as, if not more, important than operation. In this case, however, the radium apparently had no effect. During three months the tumor grew slightly larger. I then operated upon him and found a very large tumor lightly attached to the anterior abdominal wall and growing from the bladder but attached to no other structure.

It was manifestly malignant with soft gelatinous spots surrounded by harder fibrous areas. The tumor was cut off from the bladder, the lower half of which was left apparently tumor free. This was sutured up tight with a double row of plain catgut sutures and the abdominal wall was sutured, a small drain being left down to the bladder. A retained catheter was put into the urethra, this the patient passed out the night following operation. He has urinated without trouble by urethra ever since. Three months later I saw by cystoscopy some irregular tumors around the bladder neck which I took to be implantations. The top of the bladder showed no tumor, and not even the scar of the incision. His bladder neck was treated by a pretty strong dose of radium. I saw him last in May, eight months after his operation. He had a slight radium burn of bladder neck, slightly increased frequency of urination, and no tumor that could be seen or felt. He has been working for six months. Dr. Ewing's pathological report was:

Tumor of bladder, teratoid tumor.

The tumor is a nearly spherical mass, 11 by 18 by 7.5 cm. It is said to have been within the wall of the bladder, lying on upper and posterior surface, leaving the mucosa free, while adherent to the peritoneum which covers a considerable portion of the surface. The surface presents numerous soft protruding cystic nodules, which also compose most of the mass of the growth. On section the tumor is composed of a central core of dense fibrous tissue radiating out to periphery and inclosing cysts of various sizes filled with firm gelatinous material. This material becomes more abundant toward the periphery. There is a peculiar slitlike opening in the central core.

Microscopic sections show the structure of a cystic adeno carcinoma with advanced gelatinous degeneration which has destroyed most of the tumor cells. The stroma is of dense hyaline acellular fibromuscu-

lar tissue, in which there are numerous calcific foci. The general appearance is that of the intestinal gelatinous carcinomas, but the cells are flat or cuboidal and not cylindrical.

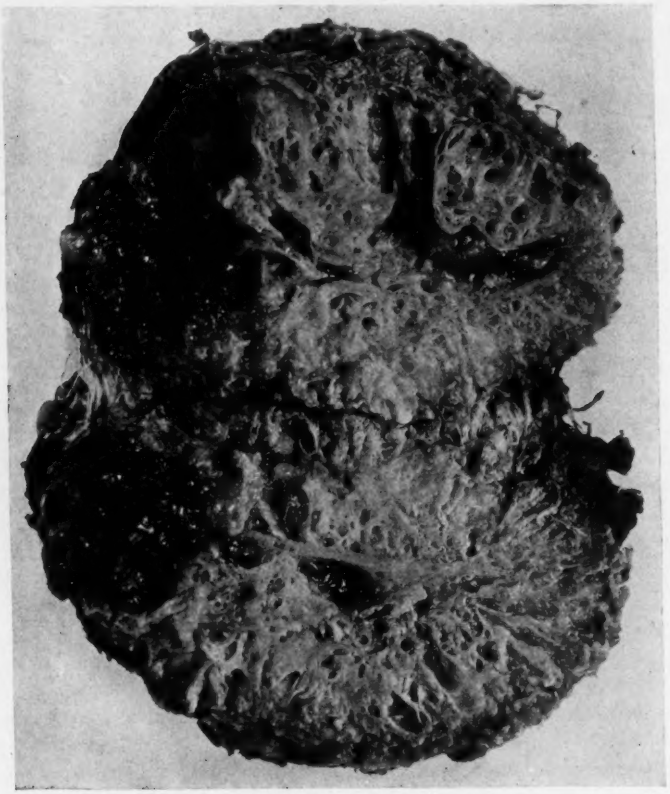

FIG. 2. COLLOID ADENO CARCINOMA OF BLADDER (SPLIT OPEN)

The tumor probably belongs to the group of teratoid tumors of the bladder, but its exact origin is not clear. Possibly it arises from a misplaced remnant of embryonal intestinal canal.

My thanks are also due to Dr. Ewing for the following comments on the tumor:

I do not find any compelling reason for assuming an origin from remnants of allantois or cloaca in the cases of mucoid carcinoma of the bladder reported by Chute and Crosbie and by Mandelbaum, or in the cases cited by them from the literature. I have looked up the original reports of these cases and find that all the tumors were located in and often confined chiefly to the vesical mucosa. The development of mucous carcinoma from the epithelium of the vesical mucosa, either on the basis of cystitis cystica in which the follicles regularly produce mucus, or from the mucous glands of the trigone, has been fully traced by Stoerk. There is no doubt that mucous carcinoma of the bladder occasionally arises in this way as does the usual type of carcinoma without mucous changes. In Haake's case there were extensive mucous changes in a polyoid tumor attached to the mucosa by a long pedicle.

Your case, however, appears to be quite different from all the cases cited above in that it was chiefly extravesicular, being merely attached to the wall of the bladder and invading it only slightly, and unaccompanied by any broad invasion or involvement of the mucosa. For such a tumor it seems necessary to assume an origin entirely apart from the structures of the mucosa, and remnants of the allantois or cloaca present themselves as possible sources. Since your tumor lay near the apex of the bladder and since the allantoic duct as Piersol points out forms the upper part of the bladder, the allantoic duct seems the most probable origin. I have been unable to find any reference to tumors of the adult arising from allantoic epithelium, and know nothing about the probable structure of such tumors if they exist. Your tumor has a very peculiar gross structure. It presented a hard fibrous core about 3 to 4 cm. wide in which were slits and crevices containing only mucus, while surrounding this core on all sides were more recent and more cellular portions containing alveoli of adeno-carcinoma and growing cells with much mucus in alveoli and stroma. Such a gross structure could hardly have been produced from any tissues originally within the bladder mucosa. Therefore, an origin from some extravesicular tisse rest appears highly probable, and the allantoid duct seems to be the most natural source of such a tissue rest. This origin can only be regarded as an assumption.

I have been unable to find any tumor like yours in the literature of bladder growths, but there is a series of very firm gelatinous carcinomas of the pelvis to which your case may belong.

HOUR GLASS BLADDER

REMARKS ON THE RESECTION OF THE BASE OF THE BLADDER FOR TRANSVERSE SEPTA

JOHN R. CAULK

St. Louis, Missouri

Abnormalities of the bladder are becoming more and more frequently observed since our diagnostic facilities have been so much improved. I wish to report two cases which seem to offer enough clinical interest to be worthy of presentation before this Association. The term "hour glass bladder" is rather confusing, since the cause of the deformity seems to assume so many pathological variations. Really, there are but few hour glass bladders described. Fuller's cases which were reported before this Association in 1900; Pagenstecher's cases, as well as those of Pielicke, Fothergill and Passow; the anatomical reports by Orth; and the one of Squier seem to comprise about all the cases presented. The case of Squier, of course, gave an hour glass appearance, but was due to a diverticulum, the others were hour glass deformities due to the contraction of the bladder wall itself. Anatomically these bladders are definitely hour glass. The cases which I wish to report are anatomical and physiological hour glass bladders. By this I mean that there is a physiological contraction of the bladder over the dome in the segment corresponding to the transverse septum of the base.

In the cases of Pagenstecher and Fuller, the contraction was anterior to the ureteral orifices and these orifices were in the upper chamber. My cases showed a partition across the base of the bladder, about one inch behind the interureteric bar, which divided the bladder base into two compartments, the ureteral orifices being in the anterior or lower chamber, similar to the cases of Fothergill and Passow, cited by Legueu. My

excuse for presenting these cases is to call attention to the surgical technique which was employed for the removal of these partitions.

Various degrees of hypertrophic bands are frequently seen in the obstructed or in the neurogenous bladder, and most are coincidental rather than causal factors in the productions of symptoms, and I dare say that most of them are of a congenital nature with a superimposed pathological process. One of my patients had several congenital deformities, viz., hare-lip and hypospadias; the other one had not. Hypertrophies of the interuretic bar are not uncommon, and incisions by cautery or by knife either suprapubicly or endovesically have been reported.

Case I. M. B., Milwaukee, Wisconsin. Male, forty-two. Complained of frequent painful urination, painful defecation, pain in the bladder and rectum.

Family history: Negative.

Past history. Had scarlet fever and diphtheria as a child with no complications. Frequent bed wetting until nine years of age. Until thirty-five years he was in fairly good health. In 1908 suffered a nervous breakdown and shortly after this had a protracted fever which was supposed to be typhoid, but which impresses one as having to do with urinary toxemia. He gave no history of venereal diseases. In the patient's younger days he had been mentally quite active and alert, was an editor and magazine writer.

Present illness. Since 1908 the patient has been extremely nervous, has had a great deal of digestive disturbance, mental depression, drowsiness, and headaches. At times would fall asleep at his desk, and has even fallen asleep riding a bicycle. Two months after the beginning of this illness, he began to have trouble with his bladder, viz., frequent, painful urination, at first with blood. This was treated by internal medicines and irrigations and improved. In 1912, after suffering constantly with his bladder he had another severe nervous attack. We catheterized and a pint of residual urine removed. Since this time he has suffered constantly with pain in the bladder and rectum, general depression, drowsiness, weakness, exhaustion, frequent chills and fever. An interesting feature of his history is that he noticed that he could urinate much more freely lying down than he could standing, and later could only urinate while flat on his back. Since 1915, that is a year before admission, he had complete retention and since has been on catheter

life. Catheterization has always been painful and frequent, often every fifteen minutes. Has been diagnosed by several men as having a nervous lesion.

Examination. Patient is a pale, poorly nourished individual, very drowsy. Eyes normal and general neurologic examination negative. Has a hare lip, but not a cleft palate. Heart, lungs and abdominal examination negative. There is a balanic hypospadias, otherwise external genitalia are negative. Rectal examination shows slight relaxation of the sphincter; prostate and vesicles chronically inflamed, but small; lumbar puncture, negative; phenolsulphonphthalein test less than 40 per cent. Blood examination normal, except for slight loss of the hemoglobin. X-ray of the spine, negative; proctoscopic examination shows normal mucosa but there is a note that the bowel seems fixed anteriorly.

Cystoscopic examination. Complete retention of urine; bladder capacity 500 cc. Cystoscope shows a slight median bar, moderate relaxation of the internal sphincter; marked trabeculation of the bladder; hypertrophy of the interureteric bar; about three-fourths of an inch behind the interureteric bar is an elevated band which runs transversely across the base of the bladder, fans out on each lateral wall, and has a concavity anteriorly, giving the bladder a double pouch, the basfond in front and another pouch behind. Mucous membrane over the bladder bar is pale.

With negative neurologic findings, except for a suggestive internal orifice and slight relaxation of the rectal sphincter, I decided to do a suprapubic operation, designed to remove both the median bar obstruction and the transverse band across the bladder, which seemed to project at least one-half inch. This operation was done in February of 1916. Mid-line suprapubic incision under gas and ether, showed the bladder to be quite large. It was freed thoroughly. This step, the mobilization of the bladder before attempting resection, is very important in all operations for bladder resection. Upon opening the bladder it was found that there was very little obstruction at the internal orifice; this band previously alluded to was quite marked, being tense and firm. The interesting finding was next encountered. The bladder wall back of the band was very redundant and freely movable. By grasping it with a mouse toothed forcep, the bladder mucous membrane well back on the base could be carried over the bar and pressed into the neck of the bladder, offering a satisfactory explanation for the initial attacks of retention and for the peculiarity which the patient had in not being

able to urinate standing as well as lying. The surgical procedure adopted was a resection of an elliptical area across the base of the bladder 4 inches transversely and about three inches antero-posteriorly. This removed the bar which was in the anterior part of the resected portion and took away enough of the redundancy to allow the bladder wall to be brought together without tension. The mucous membrane seemed to be particularly freely movable over the musculature in this posterior pouch. The septum was very fibrous, hard and extended through the bladder wall with perivesical adhesions, so that there was some difficulty in removing it from the surrounding tissue. This was done without complications and after the posterior bladder wound had been closed the bladder really had the normal appearance of one. Ureter catheters were then passed well up in each ureter with an attempt to keep the bladder dry. I may say that I do this very frequently in bladder resections and have found it a very valuable adjunct. Catheters are brought out through suprapubic drainage tube. The median bar was then removed, the bladder closed anteriorly around a tube, two drains passed around the bladder to the base in the neighborhood of the suture line, and a small drain in the space of Retzius. The suprapubic wound closed as usual. The patient made a prompt and satisfactory recovery, having not the slightest complication. The tissue drains were removed from 48 hours to four days, catheters removed the fourth day, suprapubic tube on the 8th day. At the end of four weeks the wound had healed and the patient was passing his urine naturally. I have just received a letter from him stating that he is having no trouble with his bladder and is in better health than he has been for years. As he describes it, he is "full of pep."

Case II. Mrs. W., Fort Worth, Texas, forty-two years, consulted me in March, 1919, complaining of painful, frequent urination without relief; pain in the right kidney and bladder.

Family history. Negative.

Past history. Always healthy except for attacks of appendicitis from sixteen to twenty-five years of age when appendix was removed with cure. Menstrual history, negative. Married in 1907, had one child fifteen months after marriage. Difficult labor, torn, repaired with excellent result. One miscarriage since.

Present illness. First bladder trouble started four months after marriage. Onset sudden with frequent burning urination, terminal hematuria. Was sick one month. Associated with this she gives a typical history of pelvic inflammatory disease for which she was treated without

surgery. No further bladder trouble for four years. All during her married life she says she has used vaginal suppositories of bichloride to prevent conception and they have always burned her. In 1912 she had another sudden bladder attack which lasted for six months. At this time she had to get up five to seven times at night to urinate. Bladder was treated by local instillations, irrigations and urinary antiseptics. At this time the patient was found to have no kidney involvement and she had never suffered any kidney symptoms. Following this she was well until June of last year, when another sudden attack occurred; she was treated with $AgNo_3$ instillations by her doctor, and in a few days improved. Then following an installation in the bladder, given by a nurse, she had a sudden acute pain in the bladder and became unconscious; later had a chill, high fever, vomiting, pain in the right kidney, which became severe. The temperature ran as high as 105°. This lasted intermittently for two weeks. At this time she had an acute retention of urine and a large slough of bladder mucous membrane was removed through the meatus. Patient was sick at this time in the hospital for ten weeks. Since then has never had relief from her bladder and has had intermittent pains in the right kidney with pyuria. Urinates every fifteen minutes to one hour in the daytime and every hour at night, and suffers paroxysms of bearing down pain in the lower abdomen. Since last summer has experienced considerable pain in the rectum and straining. She feels that her bowels must move when her bladder empties and vice versa. Recently has had an almost constant aching pain in the right kidney with intermittent fever. Has lost but little weight.

Examination. Patient well nourished, good color. General examination of heart, lungs and abdomen, negative; nervous system negative; patient voids very frequently and seems to suffer pain and straining. Blood examination, normal; blood nitrogen, 56 mgm. to 100 cc. X-ray, negative.

Cystoscopic examination. Bladder capacity restricted, holds only 150 cc.; bladder very spastic; urine grossly clear but contained scattered pus cells and a few colon bacilli on centrifugation. Internal orifice somewhat irregular; general fine trabeculation of the bladder; trigone slightly elevated, right side somewhat retracted; right ureteral orifice was open and gaping, and looked almost like the orifice of a diverticulum. Left ureteral orifice normal; no ulceration of the bladder; no evidences of tuberculosis. About 1 inch back of the trigone is an elevated partition that completely crossed the base of the bladder and fanned out on

either side, causing a slight puckering of the bladder laterally, with a depression in front of and behind it (fig. 1).

Ureter catheters passed easily to both kidneys. The urine from each was clear, the right containing a few pus cells. Intravenous phthalein appeared in three minutes on both sides; first fifteen minutes on the right, 11 per cent, on the left, 12 per cent, second fifteen minutes, on the right, 8 per cent, on the left, 10 per cent. Pyelogram showed a hydronephrosis and hydroureter on the right.

Cystogram done later showed the interesting hour glass bladder which you see before you (fig. 2); also showed the patent ureteral vesical valve with reflex up the right ureter and a complete filling of the right

FIG. 1. BLADDER SHOWING TRANSVERSE SEPTUM

kidney pelvis, which was described by Kretchmer. It also shows the haustrations of the ureter from spastic contraction, which are frequently seen and which could be mistaken for strictures, but which can be relaxed by atropin.

This patient was operated on April 3; suprapubic cystotomy with resection of the base of the bladder containing the transverse band. This partition was very hard, almost cartilaginous and extended completely through the wall of the bladder and was adherent to the rectum which explained her rectal symptoms. The same operation was done as in the previous case with the natural exception of the prostatic condition. Patient had a very satisfactory convalescence; the wound healed the

FIG. 2

FIG. 3

twenty-third day. At the present time she is entirely relieved from all her pain in the bladder, rectum and kidney. She has frequent urination although she has gone three hours in the daytime and four hours at night. The hour glass contraction in this case was produced by the band on the base of the bladder with a spastic contraction of the muscle of the dome; as there was no anatomical pathological change in the anterior wall of the bladder. Cystogram made six weeks after the operation shows but slight evidence of constriction and loss of the hour glass appearance (fig. 3).

SUMMARY

I am convinced that incising these bands would not have effected a cure, as they implicated the whole bladder wall, similar to the Hunner ulcer and nothing short of complete resection can hope to cure the patient. The operation is not hard, can be performed from within out, but must be carefully done when approaching the external coat of the bladder. Hemorrhage can be easily controlled. The first case is of interest on account of the resection of such a large amount of redundant bladder wall and is an illustration of a prolapsus which has been described by Villier, Streubel, Vary and others.

I wish to emphasize the importance of free mobilization of the bladder before resection; the value of ureter catheter drainage in bladder resection; the need of complete removal of such transverse partitions and not temporizing with mere slit operations; the importance of vesical spasm in the neighborhood of inflammatory areas which in case 2 served to magnify the hour glass contraction; and finally, the protective value to a kidney of removing causes of vesical spasm in the presence of a patent ureteral vesical valve.

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MIGRATING BLADDER STONE

B. S. BARRINGER

New York

Some months ago a patient, about fifty years old, came to Bellevue Hospital and upon making a rectal examination I found just within the anal sphincter a stone nearly as large as a hen's egg. An attempt was made to remove it but we finally had to put the patient under ether to do so. It was grasped by a large stone forceps and considerable force was necessary to extract it. The stone was black, rough and shining like coal. The patient's history was as follows:

Twelve years before he had a perineal section and perineal drainage, the exact reason for which I could not ascertain. Urethral sounds were subsequently passed. Ten years ago he entered a hospital because of partial retention of urine, dribbing and abscess formation in the perineum. He was told that he had a growth in the rectum because of marked constipation and straining at stool. Another perineal section was performed. Ever since this last operation he has noted at intervals the escape of urine from his rectum and fecal matter from his urethra. For the past six months this has been constant with great urinary tenesmus and very often fecal and urinary incontinence. He has had the sensation of some obstruction and dull pain in his rectum and has noted that his stools were ribbonlike. A year ago he again went to a hospital for an abscess in the perineum. This was opened by a house officer who subsequently passed sounds and the patient was discharged. As far as we can ascertain he never had a rectal injury, and never had introduced any foreign body into his urethra. He had an attack of gonorrhea at the age of twenty-one.

The patient had, in summary, a history of illness for twelve years—had had three operations and complained of the passage

of urine by rectum and feces by urethra, much pain and great loss of flesh and strength.

The examination of the stone by Dr. Ewing revealed the following.

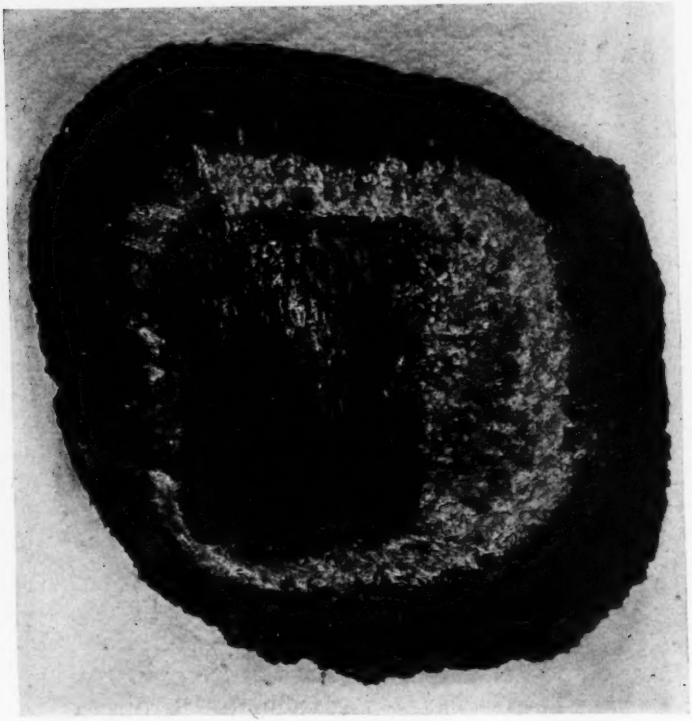

FIG. 1. MIGRATING BLADDER STONE
4½ cm. x 4 cm. 3 cm. thick

It has as a nucleus a piece of the shaft of a long bone, probably human, 1.5 cm. long by 0.5 cm. wide. The identification is based on the presence of bone structure identified under the microscope. One finds Haversian systems, lamellae of bone, stellate bone cells in orderly concentric and parallel arrangement. The bone seems to have been

slightly softened but cuts or chips with great difficulty. What changes it has passed through are not clear, but I know of nothing in nature which presents the structure shown by this material except bone. It looks like bone in the gross. The piece has been sawed at both ends.

This center nucleus is surrounded by lamellae of phosphatic crystals in which no fecal matter is found except in the way of slight staining. This clearly indicates that the stone arose in the bladder.

Whence came the bone is a mystery. Subsequent to taking out the stone the patient vastly improved locally and generally and when he left the hospital no fecal matter came through the penis and but a few drops of urine were passed rectally. He urinated six to seven times a day, and two to three times at night. There was no urgency. Sounds up to 29 passed easily. There was, I regret, no cystoscopy. With the source of the bone and the time of the passage of the stone from bladder to rectum veiled in mystery, one thing is clear—that the presence of the rectal stone caused the vesico-rectal or a urethro-rectal fistula to persist and its simple removal caused such a fistula to very nearly heal, and caused an extraordinary change in the patient. He left the hospital vastly improved in weight and strength.

OBSERVATIONS ON THE TREATMENT OF VESICAL CALCULI

AN ANALYSIS OF 455 CASES FROM THE MASSACHUSETTS GENERAL HOSPITAL

J. DELLINGER BARNEY

Boston, Massachusetts

The Massachusetts General Hospital saw the final development of the lithotrite and the evacuator in the hands of the late Dr. Henry J. Bigelow in the '76's. Successive generations of house pupils and staff surgeons have been taught the art handed down from the master, so that those of us of a younger generation turn naturally to lithotrity and litholapaxy as the operation of choice in the great majority of cases of vesical calculi. Yet as one travels around from hospital to hospital, whether it be in Boston or elsewhere it is obvious that, with few exceptions, the suprapubic operation is the one most generally resorted to. Being somewhat confused by this apparent divergence of views as to the most satisfactory method of approaching these cases, it was decided to let the records tell their own story.

I have accordingly collected 455 cases of vesical calculi from the hospital records, going back from the present time to about 1870, when lithotrity and litholapaxy were receiving their finishing touches at the hands of Dr. Bigelow. There were 392 cases of lithotrity and 63 cases of suprapubic cystotomy. No selection of cases has been undertaken except to exclude those (of which there was a very large number) in which, owing to other operations or conditions, the desired data might be vitiated.

Certain generalizations are of interest. Of the entire series of 455 cases, 442 were in the male. Thirty-two per cent of these occurred between the ages of sixty and seventy, 67 per cent between the ages of fifty and eighty. The youngest patient underwent a lithotrity at the age of three years and recovered;

the oldest submitted to the same operation at the age of eighty-eight and died. The mortality of the whole group was 9.5 per cent. Ninety-four cases (20.5 per cent) were recurrences, of which 40 or 42.5 per cent had undergone a previous lithotrity, and 10 or 10.6 per cent had had a previous suprapubic cystotomy.

To simplify matters the data peculiar to the suprapubic cystotomies will first be set forth. There were 63 in this group and in 12, the surgeon essayed a lithotrity, but owing to the size or hardness of the stone or some other difficulty not mentioned in the records, a suprapubic operation was finally resorted to. The anesthetic was ether in 48, gas and ether in 16, gas and oxygen in 3, spinal in 4, and local novocain in 1. The bladder was drained by a suprapubic tube alone in 14, by an inlying catheter in 40, by both routes in 16, while in 2 cases no drainage whatever was used. There were numerous complications during or after operation. Four cases developed epididymitis, serious wound infection took place in 11, "uremia" intervened in 6, the peritoneum was accidentally opened at the time of operation in 2, subsequent peritonitis developed in 1, another had a periurethal abscess, 2 suffered from extravasation of urine, and 2 others contracted pneumonia.

The group of 393 cases of lithotrity has also its points of interest. Ether alone was administered in 332, gas and ether in 22, gas and oxygen in 5, spinal anesthesia in 20, while in 10 the urethra alone was anesthetized with alypin or cocain. Bladder drainage was carried out in only 119 cases, the remaining 272 patients being denied this undoubtedly considerable advantage. The complications peculiar to this group include epididymitis in 13 cases, "chills and fever" in 11, persistent hematuria in 9, periurethral abscess in 4, anuria in 3, and temporary postoperative incontinence in 2 (both in women). From two to five sittings at intervals of as many days, and sometimes lasting from one to two hours were found necessary for the complete removal of the stone in 18 cases; in 7 there were multiple stones, and in 5 foreign bodies were found to be the nucleus of the stone. In 3 cases the jaws of the lithotrite could not be closed tight owing to the accumulation of crushed stone and the instrument had to be

removed by perineal urethrotemy. Diverticulum of the bladder (one in a female) was noted in 3, and in each the difficulties of the operation were enormously increased by its presence. In 1 case it was noted that the stone was strongly adherent to the bladder wall. The largest stone mentioned in the records had a diameter (as measured by the lithotrite) of $2\frac{1}{4}$ by $1\frac{5}{8}$ inches, while the heaviest stone weighed 1380 grains.

In comparing certain items of the two groups some interesting facts are brought out. Post-operative residence in the hospital averaged 35 days for the cystotomy cases, 11 plus days for the lithotrity cases. The longest stay of a lithotrity case was 74 days, the shortest 1 day, there were several of these; the longest residence of a cystotomy was 105 days, the shortest 11 days.

Comparison of the mortality of the two groups shows 25 per cent for the suprapubics and only 7.25 per cent for the lithotrities. As regards the causes of death "uremia" (so recorded) leads in each, 7 in the former and 9 in the latter. Sepsis caused 4 deaths in the suprapubic group and pneumonia, shock, peritonitis, and extravasation of urine each one case. In the lithotrity group further causes of death are stated to be pneumonia in 6, cardiac failure in 4, peritonitis in 4, rupture of the urethra in 2, and gangrene of the bladder in 1.

By division of the whole series of cases into decades from 1870 to date and comparing common factors some interesting features are brought out. No suprapubic operations were performed between 1870 and 1890 so that the cases studied in those years comprise only lithotrities. In the first decade the mortality was 10.3 per cent and the average postoperative stay in the hospital 19 days. The bladder was drained in but 1 case.

In the next decade (1880–1890) the mortality was 9.8 per cent, and the average stay in the hospital 15 days. Bladder drainage was resorted to more frequently, but only in about 11 per cent of the cases.

Beginning with 1890 we have suprapubic operations to reckon with, and to compare with lithotrities. From 1890 to 1900 there were 124 of the latter and 17 of the former. The mortality of

the suprapubics was 53 per cent while that for the crushing operation was but 4.9 per cent. The contrast in hospital residence is equally striking for that of the cystotomies was 43 days, while for the lithotrities it was but 9 days. In the latter group bladder drainage was employed in about 35 per cent of the cases.

From 1900 to 1910 the total number of cases of vesical calculi (appropriate for this analysis) fell off considerably, there being but 92, of which 58 were lithotrities and 34 were cystotomies. Whereas in former decades ether alone was used as an anesthetic, in this period the combination of nitrous oxide with ether was frequently employed and gas-oxygen occasionally. Local anesthesia of the urethra was done 8 times. Suprapubic mortality fell in this decade to 10 per cent, whereas that of lithotrities, while still making a better showing, rose from 4.9 per cent, to 7.01 per cent. Days in the hospital remained practically the same (9 days) after the crushing operation, whereas after cystotomy it dropped to an average of 34 days.

Sixty-seven cases were collected from the records from 1910 to date. Lithotrity was done 45 times and cystotomy 22 times. In addition to the anesthetics already mentioned as being used in the previous ten years, spinal anesthesia now came into use (24 cases). Mortality of lithotrity for the past 9 years has been 2.2 per cent as compared with 13.6 per cent for the suprapubic cystotomies. The latter have remained in the hospital an average of 29 days, the former an average of 7 days.

Given a case of vesical calculus which is the best operation as regards mortality, stay in hospital, and recurrence. The foregoing statements of fact show convincingly that while the prospects of recurrence of the stone (or let us say incomplete removal of the fragments) is considerably more with lithotrity than with cystotomy, the other two factors (mortality and hospital residence) are so much more in favor of lithotrity that there would appear to be no argument.

Let it not be forgotten however that the lithotrite and the evacuator are very special instruments and that they require special skill for their proper use. In the hands of the rough or untrained general surgeon either implement, but especially the

lithotrite, may do great damage. Such an individual should certainly do a cystotomy rather than a crushing operation. Furthermore there are certain definite contraindications to the use of the lithotrite even in skilled hands. Diverticulum of the bladder may make the performance of lithotrity exceedingly difficult or even impossible; obstructing prostate should be treated as such, the stone being regarded as a secondary affair; very large stones which exceed the limits of the jaws of the lithotrite or which prevent sufficient distension of the bladder with fluid; these are among the chief contraindications to the crushing operation. Each case must be decided upon its own merits and the surgeon must decide whether a well done suprapubic cystotomy is likely to produce more harm than a poorly done lithotrity and litholapaxy.

In conclusion I wish to lay special stress on the following points which a study of 455 cases of vesical calculi has brought out.

1. The combined mortality of lithotrity and suprapubic cystotomy is 9.5 per cent. Of lithotrity alone the mortality is 7.23 per cent; of suprapubic cystotomy it is 25 per cent.

2. Recurrence is to be expected in at least 20 per cent, especially where the previous operation was lithotrity.

3. After lithotrity patients may expect to stay in the hospital an average age of about 11 days, although a great many cases are able to leave earlier than this (often in two or three days). After suprapubic cystotomy the average stay is about thirty-five days, although in favorable cases this time may be considerably shortened.

4. Bladder drainage is of undoubted value in the after care of cases of lithotrity and litholapaxy; in cases of cystotomy it is an essential.

5. The choice of the proper anesthetic undoubtedly plays an important part in the outcome of these cases.

6. Barring certain obvious contraindications to its performance, lithotrity undoubtedly is the operation of choice. Among these contraindications is the general surgeon's lack of training in the use of the lithotrite and evacuator.

7. The steady fall in the number of cases of lithotrity and suprapubic cystotomy shown in the hospital records from about 1900 to the present time is due neither to a growing scarcity in the number of stones, nor to an increasing unpopularity of the hospital. As a matter of fact more stones have been removed from the bladder during these years than ever before, but owing to modern methods of diagnosis the stone has been relegated more and more to second place, while the underlying cause (obstructing prostate, alkaline urine, diverticulum, etc.) have commanded the surgeon's attention.

DISCUSSION

Dr. W. F. Braasch, Rochester, Minn.: Foreign bodies in the bladder simulating stone are not uncommon. I have recently observed a case where a sequestrum of bone was the nucleus of a bladder stone. The patient gave a history of having had a tuberculosis of the hip several years ago, which had evidently healed, with ankylosis. Several years afterward he first developed urinary symptoms of frequency and dysuria. An x-ray examination revealed a very definite stone in the bladder, which was removed. On section of the stone a triangular piece of bone was found as the nucleus. It would have been impossible to have inserted the bone through the urethra and it was evident that the bone sequestrum from the tubercular hip had wandered into the bladder.

Another patient gave a history of having been stabbed in the thigh several months prior to examination, and in the fray the blade of the knife broke off. No evidence of the knife could be found in the wound at the time of his injury. The patient complained at intervals of considerable pain in the thigh for a year or so following, and later urinary frequency and dysuria developed. On cystoscopic examination a stone in the bladder was diagnosed. It was removed by a suprapubic cystotomy and its examination revealed a blade of a knife as the nucleus. It was evident that the knife had wandered into the bladder from the point of injury in the thigh.

Dr. George K. Swinburne, New York, N. Y.: I wish to say a few words about the vesical calculus, because I have done litholapaxy covering a period of about thirty years, and in that time I have had over fifty cases of litholapaxy. In only four of these cases have I used general anesthesia. The majority of the cases have been done at the clinic or in my office, under local anesthesia, and the patient has gone home. In only four

cases have I found suprapubic cystotomy necessary or better. Two cases I remember very well, which had been urged to go into the hospital and have an operation. One was an old man about sixty-three, and when he was brought to me in my office I inserted the cystoscope and found a small stone, but too large for the evacuator, and as he was an old man, and feeble, I advised his waiting a week; I put him on urotropin and he was to come back in a week, when I expected to crush. When he returned the next week the stone could not be found. He probably on his next urination had evacuated it, following the urethral instrumentation.

The other case was urged by the same hospital to have an operation, but a friend of his brought him to me, and it was a very small stone, and under cocain I inserted the lithotrite, gave one crush and washed out the fragments and the whole operation took fifteen minutes. Several of the cases I did an incomplete lithotrity; that is, I crushed and washed out what I could, during the period that the patient could stand it, using only a local anesthesia, and then at different intervals I have re-crushed and washed out until the stone has entirely disappeared. Examination of these cases a few weeks after the operation will reveal whether there are any fragments left, and they can be appropriately treated. I read a paper on repeated operation, instead of completing the operation at one sitting. There have been no deaths.

Dr. JOHN S. CAULK: I wish to follow Dr. Swinburne, because he practically took the words out of my mouth, relating to the repeated, or the interval stone crushing at different stages, and the crushing under local anesthesia. I have had seventy-one vesical calculi and twenty-eight of these have been done by litholapaxy. There has been one litholapaxy done under general anesthesia; the rest were under cocain, or alypin with morphine and atropine, hypodermically, and they practically all, except the small ones, or the soft ones, have been done repeatedly, from two to five sittings. If the patient begins to get hemorrhage, and it is usually very slight—or gets discommoded too much,

stop, and do it at another sitting. We found that Bulgara bacilli have been of very great help in these cases after stone crushing, particularly in the softer phosphate stones; it seems to mush them up. We have cystoscoped patients, following the operation, and have seen fragments left behind, and which often pass out in a mushy sort of matter several days after litholapaxy. We therefore use it as routine, following stone crushing, and also following suprapubic cystotomy. We also use large doses of acid sodium phosphate to keep the urine acid, and find it very beneficial.

With reference to anesthesia: I believe, of course, that anesthesia has a great deal to do with the high mortality of former days, and I do not believe that we are practically ever justified in using a general anesthesia either for a litholapaxy, or suprapubic cystotomy.

Just about two months ago I removed a stone that weighed over half a pound, under local anesthesia without the slightest difficulty. There is no particular trick in getting the stone out. So I cannot see why we should give a general anesthesia for a stone.

With reference to the size of the stone in litholapaxy, usually the larger the stone, the softer it is; and that brings out the point again of Bulgara. I remember in one instance we could hardly get the lithotrite in the bladder around the stone, it was so large; it showed a shadow about that size (indicating) of a turkey egg, x-ray shadow, and we were able to get a lithotrite in and nibble it, crush part of the stone, and then give Bulgara. It was really a surprise to see what happened to that stone; it just crumbled up, and in four or five stages we were able to get that stone out with perfect ease, without any discomfort.

Doctor Barney mentioned the difficulty of removing the lithotrite with stone fragments. I had that happen to me. I got caught in the urethra once, and fortunately got away with it, the patient has had no trouble, as far as I know. But it is a very wise thing, instead of just bearing down and crushing the stone, to push the lithotrite in the bladder and strike the two blades of the lithotrite together several times and shake the

fragments off; you can do it nearly every time. There is practically no excuse to have the lithotrite impacted with the stone.

I have had no mortality from litholapaxy.

Dr. B. S. BARRINGER: It seems to me that Dr. Barney's statistics are not quite fair, in that the suprapubic operation has probably been done for stones that could not be crushed; and the larger stone, I believe, in cases of bladder stone, the higher the mortality. If you cannot crush the stone and have to operate upon it, then your mortality shoots up. I think the question is, in these cases, what to do with a stone which cannot be crushed. I quite agree with Dr. Caulk they should be taken out with the greatest care, under local infiltration anesthesia suprapubically; but even then I think the mortality is considerable.

Dr. J. H. CUNNINGHAM, Jr., Boston, Mass.: The suggestion Dr. Caulk has made of using the Bulgara bacillus is a new one to me. I think it is of great interest. I hope to be able to get the same results with it. The whole problem, it seems to me, in regard to whether you are going to cut for a stone, or whether you are going to crush it, depends largely upon its size, whether or not it is secondary to urinary obstruction and upon the ability of one to perform the crushing operation which, as has been pointed out, is a technical procedure that requires a good deal of skill. I think the safer thing for the average man to do is to cut. I think also if a general anesthesia is going to be employed it is better to do a suprapubic operation. I find that a good many litholapaxies are done with a general anesthesia. If it can be done with a local anesthetic I think litholapaxy is the operation by choice in cases where urinary obstruction does not exist. If, however, through the peculiar instrumental or local characteristics of the patient, it is required to give a general anesthetic, it is far better to go above and take the stone out, dealing with the urinary obstruction at the same time if such exists.

The "repeated sitting operation" does not appeal to me. The inconvenience to the patient is great, and the fragments do stir

up a good deal of irritation. I have done it only on a few occasions, and only when I could not complete the operation at one sitting.

The statistics Dr. Barney has presented to us are of great interest, chiefly in showing that in the last period that statistics are far better than in the earlier period. The objection, however, to such statistics, it seems to me, is largely the fact, as in this paper, that they are not the work of one man or system, but is the work of many individuals and the work done under varying conditions, and I think to draw conclusions that we might really find helpful in such a matter one must know what has been the important features to produce these facts. Statistics are of interest to show progress in work done, but are not helpful or of value unless we can be made to realize the cause of them.

Dr. FRANCIS R. HAGNER, Washington, D. C.: I would like to speak of one point in Dr. Barringer's paper, namely the use of radium before operation in these cases. If it is used immediately before operation it may not have any effect; but I have seen autopsies on cases of pelvic carcinoma that have had radium used and in cases it would have been absolutely impossible to operate on account of the radium causing a condition to be present that appeared as if molten wax had been poured into the pelvis, everything being tightly bound down to the pelvic walls. And it has always seemed to me that possibly the best procedure would be to operate on the cases first, then use radium afterward. I think there are quite a number of gentlemen here who have had experience with radium, and I think it might be well to have something said on that subject.

As regards the operation for stone in the bladder I feel like everybody else that the crushing operation is the operation by choice, in the properly selected cases. We use nitrous oxide and oxygen in this operation. The patients are relaxed, they are not straining, and there is just as little shock as there is in cocaine. The patients with small calculi and no serious infection of the bladder do not die but on the other hand those that do die are those having seriously infected bladders and

kidneys. If we are as careful in the preoperative treatment of this group of cases as we are in prostatectomy cases I feel sure the mortality will be lowered.

Nearly all these cases we see, certainly a large percentage of them, have alkaline urine. I believe, the use of the Bulgara bacillus, as Dr. Caulk has brought out, is one of the most important contributions. Many men have told me they do not get any results from it; they do not get any results because they do not use a good Bulgara culture. I believe in these cases if they are given large doses of acid sodium phosphate before the operation, the bladder washed out with sterile water, say every day or twice a day, and from five to eight tablets of fresh Bulgara put in the bladder, you will get a growth of the Bulgara bacillus, and then if you will operate on the patient, there is a good deal better chance of saving the case than if you go on as soon as you take a diagnosis and crush the stone or remove by a cutting operation.

Dr. H. G. BUGBEE, New York, N. Y.: This calculus was found at the time of suprapubic prostatectomy; it was found in a deep sacculation and was firmly wedged into a small diverticulum of the bladder. The sacculation was so deep that the stone felt like a prostatic lobe.

Dr. JAMES A. GARDNER, Buffalo, N. Y.: This peculiar stone that Dr. Bugbee has just shown reminds me of four or five stones which I removed from a case at the time of prostatectomy, one of which was a typical jack stone having four long prongs, the others having two or three prongs. It has puzzled me to explain just how the trabeculae in the bladder form these stones.

Dr. JOHN T. GERAGHTY, Baltimore, Md.: I wish to say a few words in regard to the use of radium. It has not been our custom to use the radium as a preliminary to an operation. In a certain number of cases we have used it, and subsequently operated, but that was because we did not quite realize the nature of the tumor at the time. But I think where one makes

a definite diagnosis that the tumor is an infiltrating carcinoma, and will require excision, I think the excision should be carried out at once. It has been our experience that the carcinomas do not respond at all to the use of radium, and I think the treatment beforehand is simply a waste of time.

Dr. ARTHUR L. CHUTE, Boston, Mass.: I have been particularly interested in the papers we have had on stone. It seems to me that the problem in the patient with bladder stone is much the same as that we have with the prostatic; that whether a given stone or its removal is dangerous or not, depends almost wholly on the patient's renal condition. In the cases where one has an extreme suppurative involvement of the kindeys, or where one has a lot of back pressure, any operation is bound to be dangerous more especially if one employs general anesthesia. I cannot conceive of the danger depending upon the condition of the bladder itself, which at most is merely an organ of convenience. I believe that the danger lies in the condition of the kidneys; that if one has kidneys that are not seriously impaired, and care is taken to keep them functioning actively, one will have little trouble following operation upon bladder stones.

Operation upon the little stones does not give much mortality, whether you open the bladder or crush them; operation on the big stones on the other hand is going to be much more dangerous —whether one removes them by crushing or suprapubic cystostomy: this is because the big stones are usually attended with a greater degree of kidney involvement. The big stone has often by its size alone dilated the bladder end of the ureter allowing of easy infection and interfering with adequate drainage.

I saw an instance several years ago of a stone that was formed about a piece of bone; the patient, a young man, had had hip disease some years before and had been treated by an eminent Grecian surgeon over a considerable time. When I saw him he had pain with difficulty in urination and examination showed what was apparently a stone caught in the prostatic urethra. This was cut down upon and removed and found to be a little spicule of bone which had become covered with some limesalts

and caught in his prostatic urethra. It was a prostatic stone built up on a spicule of bone that had wandered into the urinary tract presumably either from the hip or pelvis.

The case Dr. Caulk reported is very interesting to me; I think I have a case that is like it, which will give me an opportunity to try the treatment he suggests.

Dr. R. F. O'NEIL, Boston, Mass.: We have had some cases similar to those which Dr. Braasch has spoken of where we employed the Bulgarian bacillus. We were quite successful in the treatment of bladder incrustations with this method.

I reported a case before this Society in which there was marked improvement of the entire bladder surface, the x-ray showing a circular mottled area which is typical of the condition, in the bladder region. After long and frequent treatment with the Bulgarian bacillus the incrustation disappeared, cystoscopy showing only a generally reddened bladder and the x-ray showing no shadows. We have seen the incrustations become soft, putty-like masses which can be washed out. We have had no experience as to the effect in actual calculi. It is very interesting if Dr. Caulk has been successful in softening up calculi by this method. I think the method is of value in preventing further deposits.

I should like to ask Dr. Caulk in regard to the case of diverticulum, if I understood the paper rightly: The second case, I think, was in a woman whose disability followed a difficult labor, and she had a good deal of sloughing of the mucous membrane following it?

Dr. CAULK: No, it was not an obstetrical complication. I think it was caused by an injection of caustic soda, put in through mistake.

Dr. O'NEIL: I have seen one or two bladders which were very badly contracted, trabeculated, and deformed, from sloughing of the whole bladder membrane, which followed overdistention and infection of the bladder during labor.

I think we are all agreed that litholapaxy is the operation of choice for vesical calculus. In our school naturally we are in favor of the crushing operation. We have been brought up on it and use it on all occasions.

Dr. Barney's statistics show a higher mortality for the suprapubic operation than I had any idea of. But the cases cover a long period of time and doubtless in the earlier cases the choice of anesthetic played a certain rôle. The mortality for the suprapubic operation for very large stones is notoriously high. It is interesting to note that the small mortality of the crushing operations has not changed, in spite of the fact that many of them were performed in the presence of prostatic enlargements.

Dr. JOHN R. CAULK, St. Louis, Mo. (closing): I would like to say one word in self defense relative to the Bulgarian bacillus. I am quite surprised that Dr. Braasch and I are so diametrically opposite on a thing which seems so simple. We have had the most remarkable results with Bulgara in these alkaline, incrusted cystitis cases. If a person's kidneys are not infected, injections of Bulgara bacillus will do the trick on an alkaline cystitis. You cannot expect, in putting Bulgara into the bladder, to defeat something that is constantly being poured down on it all the time; and if Dr. Braasch is sure that his upper tract is clean (and I know he must be sure), I do not quite understand it, because I have never seen a case of true incrusted cystitis that was not almost magical in its results. Dr. Robertson in St. Louis—Dr. Johnson knows him—is a very skeptical soul, one of our best friends, and didn't believe in this treatment. He sent me a case of a genuine incrustation of practically the whole bladder wall, and urethra. X-ray showed it, and the whole urethra was just like a piece of stone. He gave that man two or three injections of Bulgara, directly through the lobes, and in two days that whole thing was poured off in a gluey mass, and his whole urethra was clean in a week (the x-ray showed nothing at this time). And we have had any number of cases. Just a week or so ago I ran into two cases of it, which within forty-eight hours began to subside and clear up.

Very frequently you have to differentiate between a true incrusted cystitis, and the incrustation of a tumor, or carcinoma of the bladder. And really this has been a diagnostic help to us. If these cases do not clear up with Bulgara they are either malignant tumors of the bladder, or infections of the upper tract.

Dr. BRAASCH: What brand do you use, Doctor?

Dr. CAULK: Chiefly the Hynson-Westcott. I have not had results with the cultures, that is, I mean the liquid cultures, Parke-Davis, but I have had results with the Hynson-Westcott tablet, since the emulsion adheres to the bladder and is certainly more effective.

Dr. BENJAMIN S. BARRINGER, New York (closing): In answer to Dr. Braasch's comment on bone nucleus for these bladder stones: This piece of bone was an oblong apparently sawed-off piece of bone, which to my mind would hardly come from an osteomyelitis. That you would naturally think would be a sharp spicula of bone. I do not know where it came from. I think the interesting part is that the patient's recto-vesical fistula practically healed after the removal of the stone.

Just a word about radium in these cases of bladder carcinoma. Two different questions have come up here: In the first place, the broad radiation of tumors before operation. I think there is a growing impression that a broad radiation of tumors before operation either by radium or x-ray, might tend to kill the tumor cells before the operation. This has been tried in breast, uterine, lip and other tumors. The cells of tumors so radiated show microscopically very decided changes, and I think some pathologists are of the opinion that they may be so devitalized that implantation, or recurrence at the site of the operation is less liable to take place. This case of bladder tumor which I did radiate was manifestly a tumor which could not be cured by any method excepting operation. We wished to see if radiation of the tumor before operation would have any effect in decreasing the size of the growth and second we thought that

such radiation might devitalize the tumor cells so as to make the chance of local recurrence more remote.

As an example of what broad or general radiation can do to large tumors let me cite one case: Two years ago Dr. Keyes had a teratoma of the testicle with a secondary growth in the abdomen as large as a child's head. Dr. Janeway put a very large radium pack over the abdominal tumor some inches above from the skin. A week or two following Dr. Keyes did an orchidectomy. Within a few weeks the tumor in the abdomen absolutely disappeared, and for a year and a half, by actual observation, that man has been well and has had no recurrence. I presume he will have, but he has at least been saved a year of life by radium.

The other question is the treatment of bladder tumors by radium placed directly on or in a bladder tumor and not by means of a radium pack placed some inches away from the skin and suprapubically. Dr. Geraghty and I some two years ago, were at variance in our opinions in these cases, and I have been trying ever since to figure out why we were. The first cases in which I was successful in removing infiltrating bladder carcinomas (a number of which are still well three years after removal) we used about 800 millicurie hours on the tumors. As nearly as I could figure out the number of millicurie hours that Dr. Geraghty used at any one time were from 50 to 100. I do not know that I ever saw those reports published, but I understood from Dr. Geraghty that he had about 110 mgm. of radium and that was applied through a cystoscope for possibly a half hour, or an hour, making in all from 50 to 100 mgm. hours. It would seem to me the difference between these amounts of radium used, I using 800, and Dr. Geraghty 100, or slightly more, caused our results to differ.

I still am of the opinion that more cases can be cured by radium than by operation.

Dr. J. D. BARNEY, Boston, Mass. (closing): I agree with Dr. Swinburne that the small stones can be perfectly well operated upon in certain cases in the office, or in the out-patient depart-

ment, and I think perhaps more should be done that way; but at the same time it must not be forgotten that the bladder often becomes very irritated, and that the proper distention of the bladder cannot be brought about by the proper use of the evacuator. Also Dr. P. Henry J. Bigelow pointed out previously that the fragments which might be left between sittings were more likely to produce harm than even the lithotrite itself, and we know that they are certainly very uncomfortable for the patient. We ought to do, I think, more of them, however, with local anesthesia. What I mean by that is, either cocaine in the urethra, or alypin, or the suprapubics should be done with local cocaine. I think there is a field for improvement there in our method of anesthesia, without any question. Dr. Barringer's suggestion that these cystotomies were done probably because the stone was so large, I think is open to criticism. We find that many of these cystotomies, not only in our hospital, but in other places, are done simply because the surgeon does not care to do, or does not know how to do a litholapaxy. Given a stone in the bladder, the suprapubic operation is the only one that occurs to him, whether the stone is large or small.

Dr. Caulk's suggestion of the Bulgaran bacillus, appeals to me immensely. We have not tried it, so far as I know, in softening or breaking up of the fragments. I agree with him fully that it is a very valuable method of curing alkaline cystitis. I have applied it in several cases with great success. There is one woman now whom I keep track of, whom I have seen now for two years, who uses the Bulgaran bacillus herself, with the aid of a nurse, and keeps her bladder perfectly clean. If she stops it, as a matter of experiment, or otherwise, her urine again becomes alkaline, and the bladder begins to get incrusted.

The statistics shown in this paper really do not give a good picture, from many points of view. They are the statistics of the work of a pretty high grade of general surgeon, perhaps on the whole better than the statistics would be if taken from all sorts of sources, from surgeons not connected with our hospital, or any other, and are therefore probably more favorable than the statistics in other places, and from other sources.

The paper did not bring out what is true, that we have begun to use more and more local anesthesia or spinal anesthesia, in the last ten or fifteen years; and also that the cases have been studied beforehand, and treated beforehand, the way prostatectomy is treated, with more care. In other words, the records show, which I did not bring out, that very great improvement has been made in the technique, not only of the previous care, but of the after care. And for that reason the statistics of the last ten years are far better than those of the years 1870 to 1880, or 1890, when ether was given in every case as a routine, and the patients died, I think, quite as much from the results of the anesthetic, as anything else.

SURGICAL RENAL TUBERCULOSIS: THE PROGNOSIS

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Several factors affecting the prognosis in cases of surgical renal tuberculosis have not as yet been definitely determined. Probably the most important of these are: Age, sex, coincident tuberculosis on other tissues, duration of symptoms, degree of involvement of the bladder and kidney, and bilateral renal disease.

According to the surgical records of the Mayo Clinic 532 persons were operated on for renal tuberculosis from January 1, 1894, to January 1, 1918. During this period about 85,000 patients were operated on; thus the incidence of surgical renal tuberculosis may be estimated as 0.6 per cent, A previous review has been made of the postoperative records of a portion of these cases, but the present data have been derived from more complete records and a larger number of cases.

The total number of patients (532) was employed in the estimation of many of the general statistics. Among this number were 16 patients who were known to have bilateral renal tuberculosis and were therefore not considered in the survey of postoperative results. Statistics bearing on postoperative results were based on the postoperative records of patients heard from either by correspondence or by personal examination. This number included 435 patients (84.3 per cent) of those operated on. It will be noted that only the postoperative records of patients operated on prior to January 1, 1918, were studied. In considering the influence of the different complications it was found that more detailed data were available in 346 cases in which operations were performed from January 1, 1912, to January 1, 1918, inclusive.

TABLE 1

Age

Patients operated on, 532

	per cent
2 patients, 0 to 10 years	0.4
37 patients, 11 to 20 years	6.9
197 patients, 21 to 30 years	37.0
168 patients, 31 to 40 years	32.0
89 patients, 41 to 50 years	16.7
36 patients, 51 to 60 years	6.7
3 patients, 61 to 70 years	0.6

Patients with postoperative data, 435

	Reported dead
32 patients, 11 to 20 years	9 (28.1 per cent)
161 patients, 21 to 30 years	41 (26.2 per cent)
137 patients, 31 to 40 years	26 (18.9 per cent)
75 patients, 41 to 50 years	20 (26.6 per cent)
27 patients, 51 to 60 years	7 (25.9 per cent)
3 patients, 61 to 70 years	1 (33.3 per cent)

The greatest incidence of surgical renal tuberculosis (69 per cent of the total) occurred between the ages of twenty and forty. The largest number of cases (37 per cent) is in the third decade. The condition is rarely found in the first and seventh decade. When tuberculous infection of the kidney does occur in children, it is usually in conjunction with tuberculosis disseminated in other tissues so that operation is inadvisable. Nephrectomy in children should not be done with the first onset of symptoms; it is advisable only when it is evident that the active tuberculous infection is localized to the kidney.

TABLE 2

Sex

Patients, 532

Males	338 (63.5 per cent)
Females	194 (36.5 per cent)

Patients with postoperative data, 435

Deaths	105
Males	75 (27.5 per cent)
Females	30 (18.4 per cent)

The influence of age on the ultimate prognosis is of comparatively little significance and the general mortality average remains fairly constant in the various decades. The late mortality

during the second and third decades is somewhat higher than that during the fourth decade, but the difference is not great enough to warrant any definite prognostic distinction. In the first and last decades too few cases are involved to give the mortality percentage any accurate value.

The greater number of male patients is in keeping with the preponderance of male patients in cases of other chronic infections of the kidney. The relative mortality is somewhat higher in the male. The relative duration of preoperative symptoms is practically the same in both sexes.

TABLE 3

Coincident lesions

Patients with renal tuberculosis operated on from 1912–1918	346	
Patients with coincident lesions	244	(71.0 per cent)
Patients with complete postoperative data	201	
Patients who died	33	(16.4 per cent)
Patients with one lesion	89	
Patients with one lesion who died	14	(15.7 per cent)
Patients with two lesions	56	
Patients with two lesions who died	9	(17.8 per cent)
Patients with three lesions	39	
Patients with three lesions who died	5	(12.8 per cent)
Patients with more than three lesions	17	
Patients with more than three lesions who died	5	(29.4 per cent)

Evidence of tuberculosis in other parts of the body, either healed or active, was found in 244 of the 346 patients (71 per cent) operated on since 1912. In the examination of a patient with suspected renal tuberculosis a thorough search for such complications is necessary. In fact it is questionable whether renal tuberculosis ever occurs without coincident tuberculosis in some other tissue, and which may not be apparent on casual examination. That such complications exert but little influence on the ultimate prognosis is evidenced by the fact that the mortality percentage in our cases was even lower when coincident tuberculosis was noted than that of the general average. The occurrence of coincident tuberculosis, particularly when healed or dormant, does not necessarily render the prognosis less favorable; in fact it may be regarded as an evidence of good resistance

power on the part of the patient. In reviewing the complications of the patients reported dead, it is of interest to note that when multiple lesions occurred the percentage of recovery was relatively as great as when only one lesion was noted. The only exception occurred where multiple active complications existed as a part of a generalized tuberculosis. The individual influence of the various coincident tuberculous lesions will be considered separately.

TABLE 4

Coincident pulmonary tuberculosis

Patients operated on for renal tuberculosis 1912–1918	346	
Patients having complete postoperative information	298	
Patients who died	44	(14.7 per cent)
Patients having complete x-ray and clinical examination of chest	300	
Patients having definite evidence of pulmonary involvement	81	(27.0 per cent)
Patients having definite active tuberculosis	16	(5.3 per cent)
Patients having definite active tuberculosis and complete postoperative information	13	
Patients who died (none in hospital)	6	(46.3 per cent)
Patients having doubtful active tuberculosis	17	
Patients having doubtful active tuberculosis and complete postoperative information	16	
Patients who died	3	(18.7 per cent)
Patients having definite healed tuberculosis	26	
Patients having definite healed tuberculosis and complete postoperative information	21	
Patients who died	2	(9.5 per cent)
Patients having indefinite clinical or indefinite evidence of previous pulmonary involvement	22	
Patients having complete postoperative information	19	
Patients who died	1	(5.2 per cent)

Pulmonary tuberculosis is one of the most common complications occurring with renal tuberculosis. Fortunately it is usually found in a chronic or healed form. Renal tuberculosis is not a common complication of active pulmonary tuberculosis. It occurred as a coincident infection in less than 5 per cent of our patients. As a part of a general or a miliary tuberculosis the coincident infection probably occurs more frequently. Pulmonary tuberculosis as a secondary complication of renal tuberculosis is of relatively infrequent occurrence although it is a factor in the late mortality after nephrectomy.

In 300 of the 346 patients complete x-ray and clinical examinations were made of the chest or evidence of pulmonary tuberculosis was found in 84 (28 per cent). The cases were divided into four groups: (1) Definite active tuberculosis; (2) doubtful active tuberculosis; (3) definite healed tuberculosis, and (4) doubtful clinical or x-ray evidence of previous involvement. A number of conditions such as bronchial thickening, etc., in which the physical and x-ray data were indefinite, were not included.

In group 1 were 16 patients, 14 males and 2 females (4.6 per cent) of the total number operated on. The mortality of this group as might be expected was very high; 6 (37.5 per cent) of the patients died. However, since almost two-thirds of the patients recovered it is evident that active pulmonary tuberculosis does not necessarily exclude operation in cases of renal tuberculosis, but on the contrary offers a fair chance for recovery. In the majority of these cases the active pulmonary lesion was confined to comparatively limited areas. In several cases, although the lesions were quite extensive, the general condition of the patients warranted operation. The most important factor in determining the advisability of operation was the patient's general condition.

None of the patients had diffuse miliary tuberculosis, a condition regarded as contraindicating operation; none died in the hospital, or immediately following operation, showing that the anesthetic (ether in every case) even in the presence of active pulmonary tuberculosis, had no immediate harmful effect. In several cases of well advanced pulmonary tuberculosis the advisability of operation was doubtful, but it was rightfully argued that an operation offered the only chance of recovery.

In group 2 is a small number of patients with limited active lesions. The mortality was approximately average. In groups 3 and 4 the mortality was unusually low. From this it may be argued that patients with healed pulmonary tuberculosis have developed high resisting powers against the tuberculous infection, and that complicating renal tuberculosis is an evidence that the resistance of patients is only temporarily lowered at the time of the renal infection.

Coincident tuberculosis in the genitalia rarely occurs in the female; it was noted as definite in 171 (73 per cent) of the group of 234 male patients. Twenty-six of these patients (18.4 per cent) died, 13 during the first year. The late mortality is therefore not greatly influenced by this complication. The high percentage of recoveries among the patients in this group who had clinical evidence of tuberculosis in the prostate and seminal vesicles should contra-indicate surgical treatment of these organs. It is evident that spontaneous healing must occur in the majority of instances. On subsequent examinations the prostate and vesicles are usually diminished in size, and either hard and fibrous

TABLE 5
Genitalia

Male patients operated on (1912–1918)	234	
Lesions in genitalia	171	(73.0 per cent)
Complete postoperative data	141	
Reported dead	26	(18.4 per cent)
Epididymectomy prior to operation	26	
Epididymectomy after operation	24	
Dead in last group	3	(12.5 per cent)

or apparently practically normal. Acute suppuration in the prostate and seminal vesicles is unusual. Surgical treatment of the tuberculous prostate is indicated only in certain cases of protracted vesical irritation or in the presence of suppuration.

Tuberculosis in the epididymis and testicle should be treated surgically because of the frequency of suppuration, and because the process does not usually become dormant and disappear. Furthermore a tuberculous epididymis must always be regarded as a possible focus of general infection. Epididymectomy was done in 50 patients in the series; 26 prior to nephrectomy, and 24 following nephrectomy. Three (12.5 per cent) of the last group are reported dead.

Tuberculosis, either healed or active, involving the bones and joints is not unusual with renal tuberculosis. A review of our records shows 21 (6 per cent) such cases. Of this number 10 were described as active. Four (13.3 per cent) of the patients are reported dead. Coincident lesions in the bones, even though ac-

tive, have little or no bearing on the prognosis provided it is not a part of general acute tuberculosis.

To the group of complications involving the bone should be added the cases of spondylitis. Fourteen patients were suffering with chronic, and three with active spondylitis. Two of the former and one of the latter are reported dead, evidence that chronic spondylitis does not greatly affect the ultimate result. Active spondylitis, particularly in the presence of other tubercu-

TABLE 6

Bones and joints

Patients with lesions	21 (6.0 per cent)
Patients with complete postoperative data	19
Patients with lesions described as active	10 (57.8 per cent)
Patients reported dead	1 (5.2 per cent)
Patients with spondylitis	17 (5.7 per cent)
Patients with active spondylitis	3
Patients reported dead (1 active spondylitis)	2 (11.7 per cent)

lous lesions, will necessarily make the prognosis much more serious, but it does not contra-indicate operation. One of the patients with an active process was operated on six years ago, and is living, with a fair degree of health. A number of patients with active spondylitis who were observed were regarded as inoperable either because of their general condition or the presence of other active complications.

ADENITIS

In only 19 patients was there any well-marked evidence of tubercular adenitis. In the majority of these only a few glands were involved, and in none sufficiently to require surgical intervention. Two of the nineteen patients (10 per cent) are reported dead, indicating that this complication has no bearing on the prognosis other than to indicate the high resistance on the part of the patient.

Anemia secondary to renal tuberculosis is frequently noted. Its incidence in our series was 25 per cent. As a rule the degree of anemia is not marked. The reduction in hemoglobin is sel-

dom caused by the loss of blood from hematuria. It is not in proportion to the duration of symptoms of the bladder since a number of patients with low hemoglobin had symptoms of only a few months duration. The average duration was two years and seven months which is about the general average. The greatest reduction of hemoglobin is noted with extensive renal suppuration when absorption of toxins was evidently the cause. The degree of hemoglobin gives no index to prognosis; 8 patients had 50 per cent hemoglobin, or below, of whom one died. Seven patients in the series (9 per cent) are reported dead.

TABLE 8

Hemoglobin

Patients having hemoglobin less than 80 per cent	73
Patients reported dead	7 (9 per cent)
Average duration of bladder symptoms (2 cases without)	2 years 9 months
Patients with 50 per cent or below (one died)	8

TABLE 9

Bladder involvement

	PATIENTS	DEAD	PER CENT	
Degree 1	55	8	14.5	11
Degree 2	92	9	9.7	
Degree 3	71	16	22.5	20
Degree 4	43	7	16.2	

The pathologic condition in the bladder as noted on cystoscopic examination in this series is estimated on a scale of 1 to 4; 1 slight involvement; 2 moderate; 3 marked, and 4 extreme. It was found that the patients were about equally divided between moderate (1 and 2) and marked (3 and 4), the largest single group being 3. The average duration of preoperative symptoms when the degree of inflammation was scaled 3 and 4 was two and one-half years, and when it was scaled 1 and 2 it was only one and one-half years. When the preoperative degree of bladder inflammation was slight or moderate (1 and 2) it was found that immediate postoperative improvement in bladder symptoms occurred in 20 per cent, whereas with bladder inflammation graded 3 and 4 immediate improvement was noted in

only 10 per cent. The late mortality in cases of moderate bladder involvement (1 and 2) was practically 11 per cent, whereas with advanced involvement (3 and 4) it was 20 per cent or twice as great. Although the renal disease usually has existed longer in cases of marked bladder involvement, the difference in involvement is evidently more dependent on the virulence of the infection than on the duration of symptoms.

The kidneys removed were divided into four groups: (1) Slight lesions; (2) advanced lesions; (3) complete destruction, described as advanced pyonephrosis; and (4) occluded tuberculosis (caseated). The lesions in the first group were slight, consisting of limited single areas, or multiple early lesions. The mor-

TABLE 10

Prognosis

Patients with complete postoperative data (1912–1918).....	298
Patients dead	44 (14.7 per cent)
Patients with limited lesion.....	37
Patients dead.....	2 (4.5 per cent)
Patients with advanced lesion.....	159
Patients dead.....	25 (15.7 per cent)
Patients with large pyonephrosis.....	58
Patiends dead.....	12 (20.6 per cent)
Patients with occluded T.B.....	44
Patients dead.....	5 (11.3 per cent)

tality in this group (4.5 per cent) was the lowest and seems to refute the necessity of the patient's development of immunity before the kidney is removed. In by far the largest number of patients the pathologic condition of the kidneys was described as advanced (group 2). Multiple areas involving from one to two-thirds of the kidney substance were usually found. In group 3 the process has generally existed for so long a time, that excessive suppuration has occurred. The mortality is greatest and is probably explained by absorption of toxins from the extensive abscesses with consequent damage to the other organs. Nevertheless the most gratifying results are frequently obtained among patients in this group, who before their operation are often in extremely poor general condition and afterward become quite normal. Group 4 is in reality a group by itself. It is composed

of patients in whom nature has occluded the ureter, performing a so-called auto-nephrectomy, and the tuberculous process is supposed to have run its course. In only a few such cases was there any evidence of active tuberculosis in the kidneys; in the majority, the original kidney tissue had undergone caseation. The low mortality is evidenced by the patient's high resisting powers.

It has been claimed that in cases of bilateral renal tuberculosis if the more diseased kidney is removed the patient will often improve, and in certain instances recover. It has also been claimed that infection in the remaining kidney may be reduced or overcome by compensatory hypertrophy; this has not, however, been substantiated by the end results in our series of bilateral cases. Thirteen of the 16 patients with proved bilateral renal tuberculosis are reported dead; 3 are living. None of the 13 patients

TABLE 11

Bilateral renal tuberculosis

Patients with definite bilateral involvement	16
Patients reported dead (none alive longer than 1½ years)	13
Patients living (less than 2 years after operation)	3

lived more than one and one-half years after operation, and all but 3 died in less than six months. The 3 living were operated on two years before their last report. One of these became steadily worse and recently had complicating perineal fistulas. The general health of the other two has improved. Both patients had a large active tuberculous pyonephrosis on one side, which was removed, and a fair degree of function in the other kidney. Such patients improve because the toxemia of acute infection is removed, and not because of improvement in the other kidney. When an occluded caseated kidney was removed, little or no benefit followed. Unless one kidney is practically destroyed and the other is in fair condition, operation should not be considered; and then only when infection, pain, or possibly hemorrhage renders it imperative. Many cases of bilateral renal tuberculosis in which cure by operation was reported in the literature were probably not bilateral. Doubtless pus or tuberculosis bacilli picked up by the ureteral catheter from an infected lower ureter while the kidney itself was normal, could best explain such results.

The influence of the duration of preoperative symptoms on the prognosis might be considered from three phases: (1) Its relation to the severity of the bladder infection; (2) the time elapsing before postoperative improvement, and (3) the postoperative mortality.

Although the severity of the bladder infection is largely dependent on the length of the preoperative symptoms there are other influential factors. It is not uncommon to observe marked inflammation and ulceration with symptoms of only a few weeks duration. On the other hand a fairly normal bladder is occasionally found when the disease has evidently existed many

TABLE 12

Duration of preoperative symptoms

	CASES	NO CHANGE OR SLIGHT IMPROVEMENT	MARKEDLY IMPROVED OR PRACTICALLY WELL	DEAD
1 to 3 months	30	4 (13.3%)	18 (60.0%)	8 (26.6%)
4 to 12 months	162	33 (20.3%)	87 (53.7%)	42 (25.9%)
1 to 5 years	155	40 (25.8%)	71 (45.8%)	44 (28.3%)
5 years	57	23 (40.3%)	27 (47.3%)	7 (12.2%)
Indefinite	31	4 (12.9%)	23 (74.1%)	4 (12.9%)
Total	435	104 (23.9%)	226 (51.7%)	105 (24.1%)

months. Further, with occluded renal tuberculosis when the initial symptoms had occurred and ceased several years before, the cause of the bladder infection having been removed by autonephrectomy, the bladder usually became fairly normal.

In the majority of cases the duration of vesical symptoms persisting after operation diminished in direct proportion to the length of preoperative symptoms. Of the patients with preoperative symptoms of less than three or four months duration improvement was noted immediately in 48 per cent. When the symptoms existed a year or more prior to operation immediate improvement was noted in only 15 per cent.

A review of the mortality records shows that there is surprisingly little difference in the mortality with regard to the length of preoperative symptoms of less than five years. It has been claimed that the mortality of patients with short duration of

symptoms is considerably higher than that of patients of long duration, and that a relative degree of immunity is establish among the latter. This, however, was not borne out in our cases since the group of patients with symptoms less than three months had practically the same mortality as the group in which the symptoms were of longer duration. It is of interest that the mortality in the group of patients having symptoms more than five years is considerably less than the average. This is explained by the fact that many of these patients had either an occluded renal tuberculosis or a high degree of immunity. This group also included five patients who had no evidence of disease

TABLE 13

Mortality

Operations for unilateral renal tuberculosis	516
Operative mortality	7 (1.3 per cent)
Patients with complete postoperative data	435
Deaths	105 (24.1 per cent)
One year or less after operation	58 (55.2 per cent)
Two years after operation	8
Three years after operation	6
Four years after operation	2
Five years after operation	7
Six years after operation	5
Seven years after operation	3
Eight years after operation	1
Nine years after operation	1
Ten years and over after operation	1
Date of deaths not given	13

other than albuminuria and slight pyuria, and in whom the discovery of renal tuberculosis was largely accidental.

The operative mortality (1.3 per cent) is a comparatively negligible factor. The total mortality (excluding bilateral renal tuberculosis) is 24 per cent, which includes every death from any cause following operation, some occurring as long as ten or more years afterward.

Fifty-eight patients (55 per cent) died within one year after operation. The relatively high mortality during the first year after operation has been previously noted by several observers. It would seem logical to regard the early death as an evidence of the virulence of the infection rather than as a result of the oper-

ation. It may be inferred that the probability of death decreases inversely with the length of time after operation. Owing to the inability to get accurate data as to the cause of postoperative death, no attempt was made to investigate this factor.

Many patients died from diseases other than tuberculosis and from accidents, so that the late mortality from tuberculosis is really much less than our figures would indicate. Furthermore, at least 20 per cent of the total number of deaths reported occurred more than five years after operation. It would be conservative and more accurate therefore, to regard the actual late mortality as not more than 20 per cent.

One hundred and four (23 per cent) of the living patients stated that they had not recovered from their bladder symptoms. From many of these answers to inquiries were received in less than two or three years after operation, and it is safe to assume that at least 5 per cent would eventually report recovery from their symptoms. Moreover, 64 patients reported a gain in weight and general condition, so that but for the bladder symptoms they were in a fairly good state of health.

It may be assumed therefore, that approximately 80 per cent of the patients will recover following operation for renal tuberculosis, and that a complete cure including cessation of urinary symptoms may be expected in fully 60 per cent.

CONCLUSIONS

1. Renal tuberculosis occurs most frequently between the ages of 20 and 40 years (70 per cent).
2. It occurs in the male almost twice as often as in the female.
3. The mortality in the male patient is somewhat higher than in the female.
4. The condition is usually not surgical in children; it occurs more often as a part of a general tuberculosis.
5. Evidence of tuberculosis in other tissues of the body may be found in fully 71 per cent of the patients.
6. The mortality among patients with such complications is no higher than that of the general average.

7. Multiple lesions, unless they are a part of an acute general infection, do not necessarily render the prognosis more unfavorable.

8. Evidence of healed pulmonary tuberculosis was present in almost one-third of the patients.

9. The percentage of recovery among patients with healed pulmonary tuberculosis is above the average and may be considered indicative of increased powers of resistance.

10. Coincident active pulmonary tuberculosis was found in approximately 5 per cent of the patients of whom more than 60 per cent recovered following nephrectomy.

11. Involvement of genitalia is present in at least 73 per cent of male patients and does not seem to affect the ultimate recovery.

12. Frequency of spontaneous healing of lesions in the prostate and seminal vesicles contra-indicates their removal by subsequent operation.

13. Evidence of tuberculosis involving the bones and joints was noted in 6 per cent of the cases; one-half of the lesions were active. The late mortality was 5 per cent, from which it may be inferred that the presence of such complications is an index of increased resistance.

14. Spondylitis, usually healed, was present in 5.7 per cent, with a mortality of 12 per cent.

15. Chronic spondylitis does not influence the prognosis. Active spondylitis, although it does not contra-indicate nephrectomy, will not offer a favorable prognosis.

16. Tubercular adenitis was present in 19 patients and the low mortality (10 per cent) is suggestive of a heightened resistance.

17. Reduction in hemoglobin does not necessarily affect the prognosis.

18. The mortality among patients with marked bladder involvement is twice as great as with slight involvement. The degree of involvement is dependent not so much on the duration of symptoms as on the virulence of the infection.

19. The mortality percentage is markedly influenced by the degree of pathologic involvement of the kidney, increasing in proportion to the extent of the lesion. Early lesions have the lowest mortality, and pyonephrosis the highest.

20. Occluded renal tuberculosis is indicative of relative immunity and a low mortality.

21. Operation in cases of bilateral renal tuberculosis is advisable only when there are acute unilateral complications, and then with no hope of eventual recovery.

22. Recovery or permanent improvement of the remaining kidney will not follow after one kidney has been removed in cases of bilateral renal tuberculosis.

23. The duration of preoperative symptoms does not materially affect the late mortality, but influences the postoperative results particularly as to improvement in bladder symptoms.

24. Late mortality is much the highest during the first year; it decreases with the length of time elapsing after operation.

25. The operative mortality is a negligible factor; the late mortality (five years or less after operation) is approximately 20 per cent; failure to effect complete cure is approximately 20 per cent; this leaves a prognosis of complete cure to be expected in more than 60 per cent of patients.

THE RÔLE OF THE X-RAY IN THE DIAGNOSIS OF RENAL TUBERCULOSIS OF LONG STANDING

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The progress which has been made in the last decade in the investigation of diseases of the urinary tract, thanks to the use of the cystoscope and ureteral catheter, has made possible a differentiation of lesions which before this time had been unrecognizable.

There is no disease of the kidney which can be more certainly diagnosed by the use of these modern methods than renal tuberculosis. The demonstration of diminution in the renal function, together with the presence of pus cells and of tubercle bacilli in the catheterized specimen of urine collected from one side, leaves no possibility of doubt as to the condition with which one has to deal.

In the majority of cases a diagnosis is possible by the use of these methods. But in many cases of renal tuberculosis, especially those of long duration, cystoscopy and ureteral catheterization are impossible on account of the changes which have taken place in the bladder mucosa. It may be impossible to recognize the ureteral orifices, or they may not admit the ureteral catheter; there are also some cases in which extensive ulcerative processes have led to such contracture of the bladder as to make the introduction of the cystoscope impossible or too painful for the patient to bear. In many of these cases, although tubercle bacilli may be demonstrable in the bladder urine, owing to the fact that the ureters can not be catheterized it is impossible to determine in which kidney the lesion is located, because it must be remembered that in most cases of renal tuberculosis there are few definite symptoms referred to the kidney itself.

When it is possible to introduce the ureteral catheter the diagnosis is usually easy, but there are types of long-standing chronic tuberculous processes with sluggish ulceration in which only a few pus cells can be demonstrated and tubercle bacilli may not be found even in repeated catheterized specimens.

In some cases in which the disease has progressed to complete destruction of the kidney terminating in caseation and deposition of calcium salts—the so-called auto-nephrectomy—the deposition of calcium salts will case a shadow on the x-ray negative varying in density in proportion to the extent of the process. It is just in these cases where for any of the above reasons a definite diagnosis can not be made that the x-ray will often be the determining factor in the recognition of the lesion.

When the normal kidney substance has been largely replaced by calcified caseation, a complete outline of the kidney and even the ureter may be seen on the x-ray plate and in such cases a definite diagnosis can be made immediately without the demonstration of tubercle bacilli and without recourse to ureteral catheterization except to determine the integrity of the opposite kidney.

It should, therefore, be a routine procedure to precede cystostomy and ureteral catheterization by plain x-ray examination of the urinary system in all suspected cases of renal tuberculosis.

When the calcification is limited to a single area in the kidney there may be some difficulty in differentiating this process from calculus, but a critical observation of the density, shape and position of the shadow will leave little room for doubt. When the kidney has been completely destroyed the characteristic lobular appearance of the shadows, due to the calcified caseous cavities, is very definite and is never seen in any other type of kidney lesion.

By means of stereoscopic plates the individual abscess cavities can be clearly distinguished from each other provided, of course, that the process has been of duration long enough to produce deposition of calcium salts in the areas of caseation. Calcification of the ureter is rare but, when it does appear, it is perfectly characteristic, the ureter appearing on the negative as a dense shadow,

the calcification involving the upper portion, the lower portion or indeed its entire course.

In addition to what is shown by the sclerosis of the ureter itself, a shadow may be cast by the caseous material which is sometimes seen filling the lumen of the ureter and which is identical with the contents of the cavities of the kidneys.

The fact that calcification occurs as a late process in renal tuberculosis and that this calcification will show an opacity on the x-ray plate has long been known, but the practical value of this simple method has been too little emphasized.

During the past few years several cases of renal tuberculosis have been recognized at The Brady Urological Institute from the x-ray plate alone and a summary of some of the more interesting of these cases will be given in order to emphasize the value of the routine x-ray examination.

Case I. A physician, aged thirty nine, was seen in 1907. The family and past histories were unimportant. The patient had had attacks of dull pain in the back and left flank at the age of fourteen, which were diagnosed at that time as indigestion. He first noticed frequency and burning at urination at the age of twenty, associated with hematuria. He lost some weight, had chills and fever and was incapacitated for about one year. A careful urinary examination was apparently not done at this time. The blood, however, soon disappeared and the frequency was greatly improved by instillations of silver nitrate. The dull pain in the back and left side, however, persisted, varying in intensity from time to time, and this was the patient's only complaint when he came for consultation.

The physical examination was negative and there was no tenderness in the region of the kidney nor could either kidney be felt. The urine was clear and contained no shreds or pus cells, and on this account no examination for tubercle bacilli was made. There was evidence of a chronic prostatitis on rectal examination and the prostatic secretion contained an excess of pus cells.

The patient improved under prostatic massage, irrigation, instillation and dilatations of the prostatic urethra until the pain completely disappeared. He was then referred to a gastro-intestinal consultant and in the course of an x-ray examination of the gastro-intestinal tract, following ingestion of bismuth, a remarkable shadow was seen in the region

of the left kidney. This shadow occupied the position of the kidney and showed a definitely lobulated appearance. Nothing similar had been seen at The Johns Hopkins Hospital at this time and a positive diagnosis was not made. Cystoscopic examination showed a normal

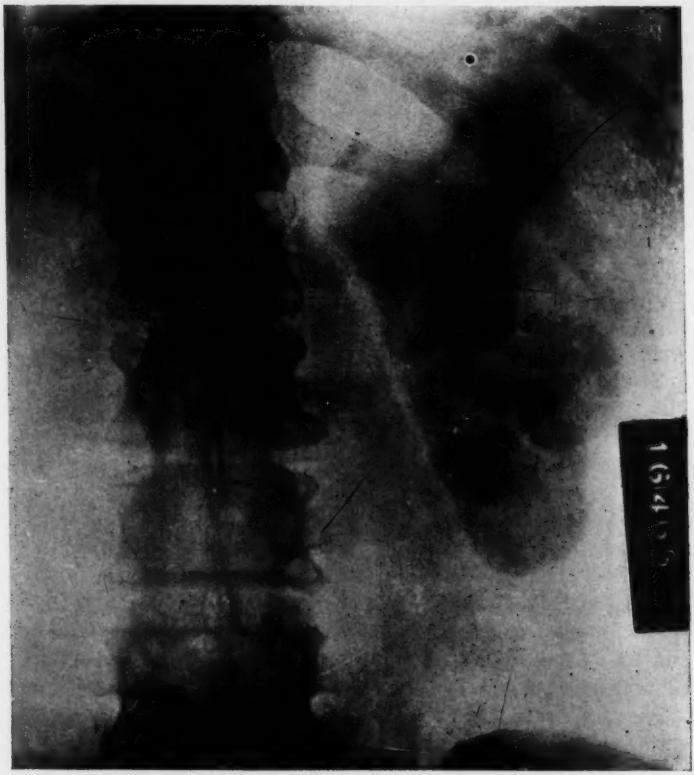

FIG. 1. CASE I. CHARACTERISTIC LOBULATED APPEARANCE OF A KIDNEY COMPLETELY DESTROYED

bladder with the exception that the left ureter could not be seen. The right ureter was easily catheterized and the specimen obtained was normal. A diagnosis of ureteral stricture with destruction of the left kidney was made, but the tuberculous nature of the process was not recognized.

The patient went to a Western clinic where a nephrectomy was done and the kidney substance was found to have been entirely replaced by caseation and masses of calcification. A letter, dated April, 1919, states that the patient has been "free from pain and a great deal better since the operation."

The correct diagnosis of this case should have been made from the x-ray alone, but at this time no similar shadow had been seen in the x-ray department. The entirely negative urinary examinations and the fact that the patient responded well to local treatment were also confusing factors which contributed to the failure to recognize the true nature of the process. (Plate I, case 1.)

Case II. A male, aged twenty-four, consulted Dr. Geraghty in June, 1914, complaining of frequent urination. His father and two uncles had died of pulmonary tuberculosis. The past history was unimportant.

Frequency with burning had existed for the past two years with little or no improvement, at times associated with terminal hematuria. There was also at times a dull aching pain in the back, mostly on the left side. A left epididymitis had appeared two years before, followed ten months later by a right epididymitis. On examination there was no evidences of pulmonary tuberculosis. Neither kidney could be felt. The left testicle was normal, the epididymitis was thickened at the globus minor where it was adherent to a scar in the scrotum. The right testicle and epididymis were obscured and the globus minor was firmly adherent to a scar in the lower portion of the scrotum. The vasa deferentia were normal. The urine contained some pus cells but no tubercle bacilli.

Cystoscopic examination showed a contracted bladder. The mucosa showed some areas of reddening especially on the trigone, but there was no active tuberculosis. The right ureter was seen but it was impossible to catheterize because the cystoscope could not be introduced far enough to permit a ureteral catheter to enter it. The left ureteral orifice could not be seen.

Plain x-ray examination showed a definite, dense shadow occupying the region of the left kidney. This shadow suggested a lobular form but it also presented a somewhat granular appearance. The ureter, which was not enlarged, could also be plainly seen in its entire course from the kidney over the pelvic brim to the bladder.

A diagnosis of the left renal tuberculosis was made and nephrectomy done by Dr. Geraghty. Convalescence was uneventful. The kidney was lobular, twice the normal size and had been entirely converted into

a cheesy mass. The ureter was very thick and fibrous, its lumen entirely filled with caseous material and practically obliterated. (Plate II, case 2.)

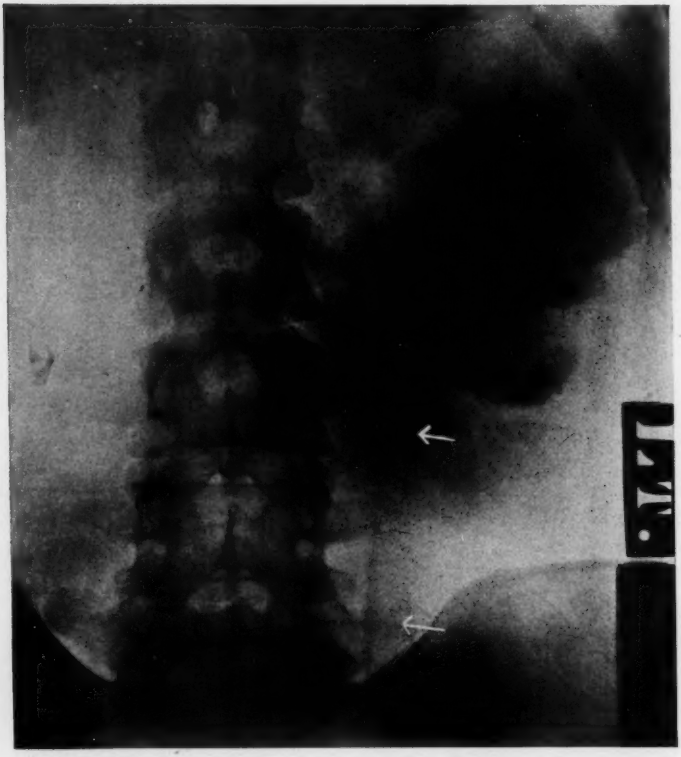

FIG. 2. CASE II. TYPICAL MOTTLED APPEARANCE DUE TO THE IRREGULAR DEPOSITION OF CALCIUM SALTS IN A KIDNEY COMPLETELY DESTROYED

The outline of the ureter is plainly seen.

Case III. A man, aged twenty-four, came for a consultation in June, 1914, complaining of frequent urination. The patient's father and two uncles had died of pulmonary tuberculosis. The past history was unimportant. The patient had first had frequency, strangury and hema uria two years before and shortly after the onset a left epidymectomy-

was done for epididymitis. A year and a half later the left testicle was removed on account of a persistent sinus.

Since this date the frequency had persisted and there had been pains in the region of the bladder but none in either kidney region.

FIG. 3. CASE III. COMPLETE DESTRUCTION OF THE UPPER POLE WITH BEGINNING DEPOSITION OF CALCIUM SALTS IN LOWER POLE OF A KIDNEY NOT YET COMPLETELY DESTROYED

Physical examination revealed no signs of pulmonary tuberculosis, the left kidney was palpable but not tender. Rectal examination revealed irregular induration of the left lobe of the prostate and seminal vesicle.

Plain x-ray examination showed both kidneys definitely outlined and larger than normal. A definite, rounded mass was seen in the region of the left kidney which closely resembled the shadow of a stone. On the right side there was a definite, irregular, lobulated shadow, not so dense as that on the left side, but much larger, the process evidently involving the left kidney more than the right.

Cystostomy showed a reddened trigone and some areas of cystitis but no active ulceration. The ureters were easily catheterized and the specimens from each side contained a few pus cells and a few large colon-like bacilli. The phthalein excretion from each side was 18 per cent. No tubercle bacilli could be found in these specimens, nor had any been demonstrated in the bladder urine after repeated examination. A guinea-pig inoculation was also negative.

A pyelogram showed a normal right pelvis, the calyces being somewhat elongated, the superior calyx extending as far as the shadow seen on this side. The ureter was not dilated. The left pelvis was normal but the calyces were greatly elongated and extended out so that they more or less surrounded the oval shadow previously seen on this side. The results of this examination tended to support the tentative diagnosis of calcified tuberculous areas in each kidney.

It was decided to explore the left kidney to determine definitely the nature of the shadow. At operation Dr. Geraghty immediately confirmed the tentative diagnosis from the appearance of the kidney delivered in the wound. On account of the involvement of the right side the kidney was replaced and the wound closed. Convalescence was uneventful. (Plate III, case 3.)

Case IV. A physician, aged forty-one, was seen by us in a base hospital in France, having been referred on account of hematuria. His mother had died of pulmonary tuberculosis. His past history was negative except for a left empyema in 1903.

He had noticed blood in his urine first in 1898 and this had continued for about two years with few or no bladder symptoms. The diagnosis of prostatitis had been made and local treatment given. In 1902, blood had reappeared in his urine and continued for a short time. In 1906, for the same symptom the patient had been sent to a Western clinic where cystostomy was performed but it was found impossible to catheterize the right ureter. From this time on the same slight frequency of urination had persisted. Following the exposure incident to foreign service the hematuria reappeared in October, 1918.

Physical examination was negative except for the scar of the empyema operation. Examination of the urine showed numerous pus cells and red blood cells but no tubercle bacilli.

Cystoscopic examination showed a small, ulcerated area on the anterior bladder wall and a rather marked injection of the trigone. The

FIG. 4. CASE IV. COMPLETELY OCCLUDED KIDNEY WITH DEPOSITION OF CALCIUM SALTS THROUGHOUT ITS ENTIRE EXTENT

left ureter was readily catheterized but no definite right ureteral orifice could be made out in spite of repeated attempts. The urine from the left kidney was normal. A definite diagnosis could not be made but tuberculosis of the right kidney was suspected and the patient invalided home to the States for further study.

On entrance to the Brady Urological Clinic after repeated examination of the urine, a few tubercle bacilli were found; the cystoscopic findings were corroborated and the plain x-ray examination showed a clear outline of both kidneys, the right kidney being smaller and the shadow remarkably opaque. On careful observation a definite, dense, lobulated

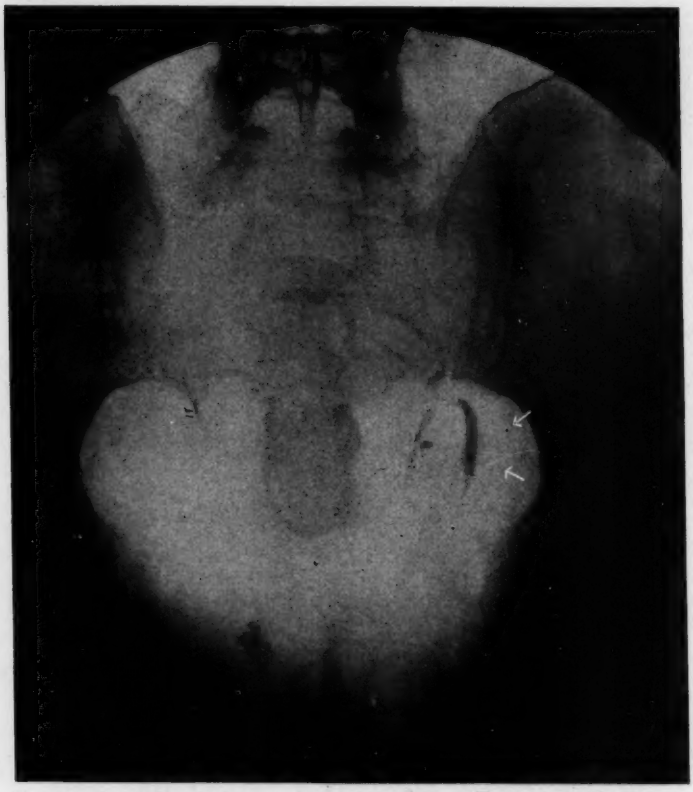

FIG. 5. CASE IV. CALCIFICATION OF THE LOWER END OF THE URETER IN CASE IV. SAME SIDE

appearance was seen and the ureter, which was distinctly opaque, could be easily made out in its course to the bladder. In the plain x-ray of the pelvis the lower end of the right ureter showed the same distinct opacity and its shadow could be seen coursing over the brim

of the pelvis. The outline of the left kidney showed no opacities and the organ could be definitely seen to have undergone compensatory hypertrophy.

From the characteristic dense lobular shadows seen in the plain x-rays and the demonstration of tubercle bacilli in the urine a diagnosis of right renal tuberculosis was made and a nephrectomy was performed by Dr. Geraghty, December 13, 1918. Convalescence was uneventful.

The kidney was found to be entirely destroyed, all kidney substance having been replaced by caseated masses separated from one another by thin layers of fibrous tissue. The ureter was entirely obliterated. This case was evidently one of long standing, slowly progressing, the initial symptoms dating back twenty years. In spite of its long duration the bladder had become only very slightly involved and tubercle bacilli were found only on one occasion among many examinations.

It is this type of slowly progressing lesion which results most commonly in the so-called auto-nephrectomy and it is in just this class of lesions that calcium salts are deposited in amounts large enough to permit a diagnosis to be made from the plain x-ray positive. (Plates IV and V, case 4.)

Case V. A man, aged forty-six, entered the Brady Urological Institute in May, 1918, having been referred with a diagnosis of left renal tuberculosis. His family history was negative. At the age of nineteen an abscess of the left testicle had been opened and eighteen months later two abscesses had been opened in the right lumbar region. Six years before he came to us a severe attack of renal colic on the right side had been followed by the passage of a small calculus and four years later a similar attack had occurred on the same side. There had been no frequency, hematuria or pain on urination, but the patient had a dull aching pain in the region of the left kidney and soreness in the left hip for the past two years. The patient was seen about one year before but the left ureter could not be catheterized.

Physical examination was negative except for slight tenderness elicited on deep pressure over the left kidney. Neither kidney could be felt on account of the thick abdominal wall. The scars of the old abscesses in the right lumbar region were well healed. The urine was clear, contained no pus cells and no tubercle bacilli.

Stereoscopic x-ray plates were taken of the left kidney and the whole organ was represented by a series of lobulated shadows which without doubt represented the calcification of the individual areas of caseation. Nine such lobules could be easily counted on the stereoscopic plates.

The shadow of the right kidney showed that it had undergone compensatory hypertrophy. There were also evidences of an old healed tuberculous process involving the first, second and third lumbar vertebrae. The total function as measured by an intramuscular injection of phthalein was normal. The patient was advised to return later for nephrectomy.

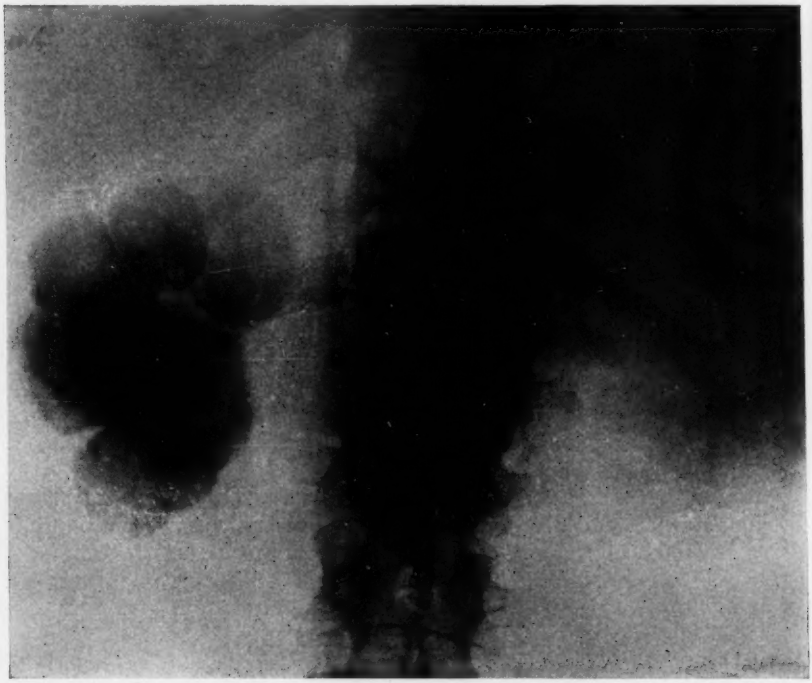

FIG. 6. CASE V. KIDNEY COMPLETELY DESTROYED, SHOWING TYPICAL LOBULATED FORM WITH DEPOSITION OF CALCIUM SALTS IN THE CASEATED AREAS

Old healed tuberculous process of the twelfth thoracic and first and second lumbar vertebræ.

Although operation has not yet been carried out on this patient there can be no doubt as to the diagnosis or as to the integrity of the right kidney. One may also assume that the left ureter has been occluded and that the process commonly called auto-nephrectomy has also occurred in this case. (Plate VI, Case 5.)

A dogmatic classification of the shadows cast by various types of tuberculous kidneys cannot be made and all graduations may occur, from the small, indefinite shadow cast by a calcified, tuberculous area about a calyx, to the beautiful, lobulated shadow which results from a completely destroyed kidney, consisting entirely of calcified abscess cavities. The x-ray of such a kidney is quite unmistakable, but the smaller, indefinite shadow which

FIG. 7. DRAWING OF THE STEREOSCOPIC PLATES OF CASE V, SHOWING THE CLEAR DIFFERENTIATION OF THE INDIVIDUAL CALCIFIED LOBULES

may be seen are occasionally difficult to differentiate from renal calculi and also from various extra-renal shadows such, for instance, as the contents of the intestines, calcified glands, gallstones, etc. It must also be remembered that the extent of the shadow on the x-ray plate does not represent the extent of the involvement of the kidney and many kidneys have been seen, on removal, totally destroyed which, on x-ray examination, showed only small, indefinite shadows, or none at all.

The presence of a true renal calculus, in association with renal tuberculosis, is rare, but several such cases have been seen in which a calcium oxalate stone occupied the pelvis of a tuberculous kidney. In all probability such a stone arises from the deposition of calcium salts in a tuberculous ulceration of a calyx. We have seen several cases of early tuberculosis in which the only focus found in the kidney after the operation was an ulceration of a single calyx. In a few of these cases there was a definite deposition of calcium salts and it is easily conceivable that a small portion of such a calcified area could break off, fall into the pelvis and form the nucleus of a large stone.

Such a stone is quite different from the picture which is occasionally encountered when a tuberculous area in a kidney, wrongly diagnosed as a stone, is exposed at operation. If an attempt is made to remove the supposed stone it will be found to consist of a grumous, putty-like material which cannot be taken out as a whole. If such a condition is encountered and its true nature recognized at operation, it is of course far better to do a nephrectomy, provided previous studies have demonstrated that the remaining kidney is normal. However, if the x-ray shows the presence of similar areas in the remaining kidney, or if the presence of its involvement has been demonstrated, no operative procedure should be attempted, as the trauma incident to operation may very readily convert a slowly progressing, partially walled-off process into an acute exacerbation or may even lead to a generally miliary tuberculosis.

It is not the purpose of this paper to discuss the very great assistance of the data which may be obtained from the pyelogram and cystogram. In an occasional case when sufficient information cannot be obtained by other means, a diagnosis can be made by these studies. It has been the practice of the Brady Clinic, however, to refrain from a pyelographic study if a definite diagnosis of renal tuberculosis can be made by the usual methods. There have been no bad results following this method but we have not felt that in cases where the diagnosis was already certain the additional instrumentation was justified.

CONCLUSION

1. X-ray studies of the entire urinary tract should be carried out in all cases of suspected renal tuberculosis.

2. In some cases when other methods of examination have failed, a definite diagnosis of renal tuberculosis can be made from the plain x-ray alone, but whenever possible, catheterization of the other ureter should be done to establish the integrity of the opposite kidney.

The shadows depend entirely upon the amount of calcification which has taken placed in the diseased kidney.

4. Various types of shadows may be seen in the plain x-ray of a tuberculous kidney, varying from the indefinite shadows cast by small areas of calcification to the characteristic lobulated shadow which is typical of a completely destroyed kidney.

5. Pyelography and cystography may clear up the situation in some cases but these procedures should not be carried out if a diagnosis can be made by other and simpler methods.

Since this article was written a paper by Braasch and Olson (Roentgenographic Diagnosis in Renal Tuberculosis, Surgery, Gynecology and Obstetrics, xxviii, 6, p. 555), has appeared in which virtually the same conclusion has been reached.

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KIDNEY DAMAGE IN "SILENT" RENAL OR URETERAL CALCULI

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It is a well known fact that renal calculi exist which give few if any symptoms, since they are occasionally shown by the x-ray when some other lesion is being studied, or the discovery of albumin or a few pus cells by a life insurance examiner, results, on closer study, in revealing their presence. How frequently these so called silent calculi occur and how much damage they cause the kidney is not so well known.

A question of equal interest and likewise one about which there is very little accurate data is that concerning cases in which non-operative treatment has to be considered: how long can a stone known to exist in a kidney be left without serious damage to the kidney: can damage occur without showing signs in the urine?

In hopes of getting a few facts to help out on these questions I have gone through the literature of the last few years and have also looked over four thousand autopsies done at the Massachusetts General Hospital since 1896, and where stones were found have noted the gross and microscopic condition of the kidneys and correlated these data with the clinical symptoms and urinary findings.

In the text books and literature on renal calculi it is assumed and I believe correctly, that a stone is a potential if not at the time an actual cause of damage and as such should be removed. But in a few of the more recent articles there are statements as to what the author believes is sufficient reason for not operating.

Braasch says that when a stone is 1 cm. or less in diameter it is a question whether operation is needed or not.

Kretschmer without giving any figures as to size says that with small stones intervention is unnecessary.

Bevan says that if a stone is ½ inch or more in diameter operation is necessary. He also says that

> The trouble given by kidney stone varies tremendously. I have seen a number of cases where the kidney stones had existed for years and where they were simply innocuous and where they gave rise to no symptoms whatever. We cannot properly insist upon operation for removal of kidney stones merely because we have definite evidence of their presence.

Willliam J. Mayo speaks of the large branched calculus where removal would mean much kidney destruction and says he has seen "several patients of this description who have gone for years without apparent progress of the disease."

Furniss in writing about the damage done by renal calculus says that it is entirely due to obstruction and infection and that stones in calyces cause little damage.

Kraft as quoted by Keys found forty cases of renal stones in 2953 autopsies and his conclusions are as follows:

> If a calculus remains embedded in the cortex the pathological changes may be slight or absent and when they do occur they are due to infection. If the stone is in the pelvis or calyx it almost always produces more or less well marked pathological changes and invites infection.

Since 1896 there have been 3960 autopsies at the Massachusetts General Hospital and in 45 cases stones were found in the kidney or ureter or both. Of these cases 7 were cases which had been operated on for stone and one small stone out of many or a fragment from a large stone had been lost in a pyonephrotic cavity, or in a bilateral case one side had been done and the second side was to have been done at a later operation. There was one case with calculous pyonephrosis who died without operation. In all these cases there were known to be stones and known to be renal damage so that these 8 cases are not discussed. This leaves 37 cases where stone was discovered at autopsy in patients who were in the hospital for some other condition. In 3 of these, stones were known to be present but had nothing to do with the condition from which the person suffered and which was the cause of death.

Considering the clinical side of these cases first, there were 24 patients who had no symptoms pointing toward the kidney or at least none which they thought worth speaking about. Of the 24 cases only 4 had a negative urine. Of the remaining 20, 13 had a slight evidence of trouble in the urine such as a slight trace of albumin and a few pus cells or even less: 6 had much albumin and pus, while 1 had no urinary examination recorded, in the short time before death. Six of the 20 with positive urinary findings had another urinary lesion (4 obstructing prostate and 2 strictures with perineal sinus) which might well cause the changes noted in the urine. Nine patients had symptoms which on looking back should have pointed to the diagnosis, especially as 8 of these had albumin and pus or blood or both in the urine, and 7 of the 9 died of renal insufficiency and sepsis. With all of these 7 I believe a diagnosis could have been easily made if symptoms other than those pointing toward the kidney had not seemed so important as to push the kidney picture into the background.

The pathological record of these kidneys is interesting inasmuch as it does not always correspond entirely with the urinary findings. The stones were bilateral in 7 cases out of the 37 and multiple in 20 and varied in size from 1 or 2 mm. in diameter up to large branched calculi filling and almost completely destroying the kidney.

There was only one stone in the cortex and this was not a stone but a hard piece of bone, $\frac{1}{2}$ inch in diameter. It was in a kidney showing early tuberculosis and was not itself causing any gross damage. The remainder were almost equally divided between ureter, pelvis, and calyces; 16 times in the pelvis—and 13 times each in ureter and calyces.

In 15 cases there was no gross damage to the kidney but in 9 of the 15 cases there was a definite statement about slight dilatation of the pelvis or calyces or microscopically there was some increase of interstitial tissue "with slight atrophy of renal elements." The largest stone in this series was 4.5 cm. in diameter. One was called large but no dimensions were given. Of the 15 only 2 were ureter stones and in 1 of these there was beginning

dilatation of the pelvis. The other was in a small pocket in the ureter and only slightly obstructed.

In the remaining 22 cases there was more or less damage up to complete destruction of the kidney. In 14 of these cases ureteral stones were present.

In 5 cases there was a chronic interstitial nephritis present but it was always a bilateral process and apparently had no causal connection with the stone. In 1 case after a detailed study of the kidney the pathologist ends by saying "This process can in no way be considered secondary to the stone." Microscopical examination of kidney tissue in the cases with no gross damage showed in several instances "slight atrophy of renal elements" or slight arteriosclerotic changes but in 6 cases 2 of them containing large stones there is no macroscopic or microscopic change.

In comparing the clinical and pathological aspects we find that 1 case who was known to have had a stone for six years had a negative urine and a normal kidney. Another case who had passed stones for at least seven years had a negative urine and aside from a very slight dilatation a normal kidney. Of the 4 cases without symptoms and with negative urinary findings only 1 showed an entirely normal kidney; it contained many small stones in pelvis and calyces. The other 3 were, however, essentially normal, some interstitial change and atrophy of renal elements being the only thing noted. In 2 the stones were small, but in 1 it was $1\frac{1}{2}$ inches in diameter. Of the 15 where the pathologist found no evidence of sepsis the urine contained pus in 9. Of the 6 where the pathologist found no gross or microscopic evidence of trouble the clinician found pus in 3.

CONCLUSIONS

In nearly four thousand autopsies at the Massachusetts General Hospital showing stone in the kidney or ureter there was only 1 case with a completely negative history and urinary findings and normal kidney macroscopically and microscopically; but there were 4 cases without symptoms and with a negative urine, 6 cases without any damage to be demonstrated at autopsy and

15 cases where the damage was too slight to compromise the integrity of the kidney.

Two cases with stones in calyces known to have been present for at least six or seven years who had had repeated attacks or renal colic showed one a normal and the other an essentially normal kidney.

Stones in the ureter more surely do kidney damage than stones in the pelvis or calyx, and a small stone if arrested in the ureter may do as much damage as a large one. Stones in the calyces can cause as much damage as stones in the pelvis.

Pus can be present during life without any evidence of infection or damage at autopsy, so that the presence of infection as well as of pus is necessary before important kidney damage is proved to be present.

The presence of a stone of any size in ureter, pelvis, or calyx may cause slight tissue changes, characterized microscopically as, "slight atrophy of renal elements," but these lesions are not constant, apparently are of little if any account so far as the work of the kidney is concerned; aside from this there is no damage done the kidney by the stone as such. But the vast majority of renal or ureteral stones do at some time or other cause some obstruction and always invite infection and accordingly are sources of danger to the individual.

There is no arbitrary standard by which we can say that a given renal stone may or may not have to be operated on. But in any given case without infection or other evidence of kidney damage a calculus may be left alone until it is passed—until pain forces an operation—until evidence of infection and damage begin, or until it is shown to be increasing in size so that a pyelotomy becomes more difficult. In the case of a ureter stone, if in spite of cystoscopic manipulations it has ceased to make progress, it should be removed after remaining stationary for only a relatively short time, in spite of possible lack of symptoms, as the kidney is almost certainly going to be badly damaged.

DISCUSSION

Dr. Arthur L. Chute, Boston, Mass.: In connection with Dr. Braasch's paper I want to mention a case that is very striking and illustrates an exceptional condition. It concerns a woman who was thirty at the time I first saw her five years ago. Her right kidney had been destroyed by tuberculosis. She was having attacks of acute pain in her left side, with temperature, and accompanied by anuria. One could feel, by the vagina, on her left, a typically thickened tuberculous ureter that was, as I remember, as big as a pencil. There seemed to be definite evidence of tuberculosis of the left ureter, probably involving the kidney on that side. Because of the unusual attacks of anuria that suggested ureteral obstruction due to an ascending tuberculosis of the ureter I cut down on her left kidney. As the kidney showed no macroscopic evidence of tuberculous involvement, and as the upper part of the ureter was not thickened, I did a nephrostomy. This woman has gone on now very comfortably for five years; she has been relieved of the attacks of pain in her left side and has not had the attacks of temperature or anuria. She has not passed any urine by bladder for years and her bladder will hold almost nothing. She takes care of her nephrostomy very well; instead of using any of the usual or expensive contrivances to collect the urine from her renal fistula, she sticks together the edges of a rubber bathing cap with adhesive plaster and fits this over the end of the nephrostomy tube for use in the day time. At night she swathes herself up with large bath towels. Conditions of this sort are very rare but do occur occasionally; a permanent nephrostomy not only gives relief to the pain that such patients suffer, but it also materially lengthens the patient's life. My patient gave every evidence of having but a short time to live; that was five years ago this summer—she is without pain now and a test

done some months ago showed that her kidney was able to put out about 45 per cent of phenol-sulphone-phthalein in two hours.

I want to accentuate what Dr. Colston said about stirring up those calcified areas that are occasionally seen on the cortex of a kidney. I saw a woman, a nurse, last year, who had had pain in her loin, and who it was supposed from the shadow seen in a radiograph, was suffering from a stone in her kidney. Her surgeon explored her painful kidney and found a calcified cortical area which he curetted; this started an acute miliary tuberculosis which went on to a fatal ending in a short time. This patient's trouble had been rather vague, ill health with discomfort more than with real pain; she undoubtedly had a cortical area of tuberculosis which she was taking care of and very probably would have stamped out, had it not been discovered and treated surgically.

Dr. J. H. CUNNINGHAM, Jr., Boston, Mass.: It seems to me quite impossible to express the adequate appreciation of Dr. Braasch's paper. It seems to me that is is the type of paper that forms the ground work, from which we all should attempt to work. It embodies so much and the conlusions are so decisive that it is hard, of course, to say anything in addition.

There are two things, however, that I would like to speak about: One is in connection with the tuberculous complications which are found connected with tuberculosis of the kidney. In two papers, before this society, I pointed out the relation of other tuberculous lesions often associated with renal tuberculosis, and what he has presented this morning corroborates those findings. My papers consisted not only of the clinical, but post mortem findings in tuberculous patients, and Dr. Braasch's clinical findings certainly corroborate in detail the findings that I presented at that time.

The other thing I wish to speak about is bilateral renal tuberculosis. The fact as shown by Dr. Braasch that in a year and a half following a nephrectomy in bilateral renal tuberculosis, in sixteen patients we have thirteen dead, is a very important

matter and indicates the seriousness of the situation. What to do for those patients has always been a most distressing problem to me. I have four patients with bilateral renal tuberculosis that are still alive, although the great majority of course have died. The shortest time any of these four patients have been under observation is four years, and the longest eight years. These patients are patients that I am constantly seeing. And I believe really the reason for their continued existence has been dependent upon tuberculin more than anything else. Bilateral renal tuberculous patients who do not present the immediate necessity of an operation to relieve acute conditions as did these sixteen cases, which Dr. Braasch presents, form an entirely different group. I refer to the group in which one accidentally discovers are bilateral during the routine examination of a patient with renal tuberculosis. This is the group in which I think tuberculin is of great value. In regard to these three patients receiving tuberculin which I have mentioned, it is pleasing to see the improvement in symptoms and general condition, and in all there has been absence of the tubercle bacillus in repeated examination of the urine and in pig inoculations. That is a surprising thing to me, and I do not doubt that it might well be questioned. But in these three cases there is no question in my mind about it. The last case, the fourth case, is a woman who nearly four years ago was found to have renal tuberculosis, bilateral. She was started on tuberculin, with the expectancy she would live but a short time. At periods roughly of six months intervals she was again examined, and it was found that the tuberculosis on one side was probably improved, as the phthalein test showed an increased improvement in each succeeding test. Two examinations done within the last year showed the absence of the tubercle bacillus on one side, and the presence of it still on the other side. The phthalein output had improved greatly on one side and decreased on the other, and we have done nephrectomy in this patient, and, as far as I can tell, one year later she is well. So that, surprising as this is, it seems to me we started with a bilateral renal tuberculosis, and under tuberculin got improvement on one side, and was able to do a nephrectomy on the worst side with safety.

I believe that in all patients with bilateral or unilateral renal tuberculosis, the lesions remaining after a nephrectomy for tuberculosis require attention. I do not feel, after we have done nephrectomy for tuberculosis, that we should consider the patient as well off as we can make them. There are other co-existing lesions of tuberculosis, and I think that the patient has got to be considered an invalid, inasmuch as they must be kept under observation over long periods. I believe that the various complications associated with tuberculous epididymis the lesions of the vesicles and prostate and possibly elsewhere all have to receive attention in a fair percentage of the cases. Moreover I think that tuberculosis in the genitals, has the possibility of co-existing tuberculosis higher in the urinary tract. The kidney and all genital tuberculous patients, should be subjected to investigation regarding this point, before they can be turned away as everything having been done, and above all that tuberculin should be used following all operations for tuberculosis and as the principal feature of treatment in bilateral renal tuberculosis.

Dr. JOHN R. CAULK, Jr., St. Louis, Mo.: I wish in the first place to discuss a point of nomenclature. It seems to me we should have a uniformity in our expression. We have noticed this morning that the words tubercular and tuberculous have been used, first the one and then the other. I personally believe —I may not be correct—that the word "tubercular" is incorrect, meaning a lump or nodule, and it seems to me that the men have used it with regard to tuberculosis and should have used the word "tuberculous."

Regarding stone in the kidney: It seems to me that the chief factors in the handling of the stone are the correction of retention, infection and the chemical constituency of the urine. Stones may cause no trouble and allow a kidney to go along all right with the patient in perfect health, as long as there is no retention. If there is retention and infection then we have another problem.

And here is another serious thing in kidney stone surgery: I am absolutely convinced that a great number of kidneys are removed which seem to be badly damaged but which should not be removed; cases in which the function is checked and are seemingly in bad shape. We must appreciate the fact of retention and eliminate it by ureter catheter drainage. A great number of these cases will never require surgery, and if they do need surgery a little later they will be in much better shape to stand it.

The reason I arose was just to cite one case that has been a great surprise to me, and I wondered if any one here had seen one like it. Nearly four years ago, a patient came in with three shadows as large as a small walnut in the kidney, and acute retention. He was a tabetic and very ill. We drained him with a catheter of nearly a half pint of dirty urine, and he immediately picked up. With catheter treatment he has been well ever since; has had to have it only every three or four months. He has been on large doses of acid sodium phosphate in the meantime, that is, the greater part of the time, and has been in good health. Just the other day, to check up how this patient was, we took another x-ray plate and found that there was just the slightest little shadow in that man's kidney. Evidently the change in the chemical constituents of his urine has done something to do away with these large stone shadows, which were certainly stones, there is no question about it. At the present time he has a very small shadow and is having no difficulty.

Dr. SCHMIDT: I think we are all fairly well agreed, as far as nomenclature is concerned. I think it is simply a slip of the tongue on the part of the gentlemen.

Dr. GEORGE S. WHITESIDE, Portland, Ore.: I want to agree very heartily with what Dr. Cunningham said in relation to bilateral renal tuberculosis, because we have had a considerable number of cases of bilateral renal tuberculosis that are not dead; and one of them is well, apparently, and the rest of them

are apparently improving, after several years of treatment with tuberculin, and washing out the kidney pelvis, because they were thought to be cases where operation was not advisable, and where it certainly was not imperative.

The other thing I wanted to speak of was in relation to Dr. Colston's pictures of occluded kidneys. I want to ask if there is another way in which tuberculosis in the kidney can end up without turning the kidney into a calcified mass. I have an impression—although I may be mistaken and I would like to be informed on the subject—that a good many tuberculous kidneys end up by being a hollow shell, with nothing in them, and they will not give any marked or characteristic x-ray appearance excepting when filled with an opaque solution.

Dr. Francis R. Hagner, Washington, D. C.: These surely have been very valuable papers we have had this morning. The point Dr. Cunningham brought out is a very well taken one. All of us who have used tuberculin in these cases have seen some wonderful improvements. I recall a case we have had under treatment for three years who is twenty-five pounds heavier than he was when we started treatment. He has tuberculosis of both kidneys. If I remember I recall a girl we had probably ten or twelve years ago with tuberculosis of both kidneys; no operation was done, she was given tuberculin and about two years later she developed a pyonephrosis. This was opened and drained. She recovered from the operation, a discharging sinus persisting. She complained of the disagreeable feature of the sinus so an intracapsular nephrectomy was performed. I think it is valuable in these cases with large abscesses to go in and open up the capsule and clean it out with your hand, and catch your vessels and tie them off, without attempting to take out the kidney capsule. It is a good deal safer and there is less chance of infection because you are working inside the capsule. The cavity was packed with gauze, the wound healing promptly. This girl is alive twelve years after the operation. She still has pus in the urine and has tuberculosis of the bladder and remaining kidney.

As regards washing out these kidneys, the danger of secondary infection mitigates against this form of treatment as we know all patients with tuberculosis of the urinary tract stand instrumentation badly.

Dr. JAMES A. GARDNER, Buffalo, N. Y.: I wish to repeat what I stated three or four years ago about post-operative treatment of tuberculous conditions in the genito-urinary tract. The use of tuberculin in my hands has not, apparently, been as efficacious as in the hands of some others. At Perrysburg, 40 miles outside of Buffalo where the Rollier treatment is used, they have astonished us with the results they have shown in the treatment of various infections of the bones and when we check up what they have done in the urinary tract, it seem just as astonishing. One case from whom a large pus kidney had been removed, weighed 108 pounds at time of operation and in nine months weighed 162 pounds. He looks like a truck driver at the present time and that was three years ago. We endeavor to persuade post-operative cases to go to Perrysburg and remain for nine months which is their usual course of treatment. Fresh air and sunshine constitute the treatment, but they are very particular about the way the sunlight is applied. They judge to a great extent by the tan how a patient is progressing. I think that patients whom we have had a chance to observe, have done much better under this course of treatment than with the use of tuberculin.

Dr. W. F. BRAASCH, Rochester, Minn.: I was much interested in Dr. Young's paper on "Silent Renal Stone." Several years ago, in a paper on clinical data with renal lithiasis I referred to several cases with bilateral nephrolithiasis where an operation seemed inadvisable. This is particularly true where the stones cause little or no pain, and when the stones are very large and branched. Their removal is frequently attended with destruction of considerable kidney tissue, and the patients usually get along much better by leaving the stones alone. When, however, there is some acute complication present, such as colic or infec-

tion, operation is of course necessary. The paper that Dr. Colson refers to is probably one which I read before the Chicago Urological Society in April, 1918. Shadows caused by calcareous areas with renal tuberculosis can be classified readily into three groups: (1) small scattered shadows caused by lime deposits in the calyses; (2) larger shadows of irregular density, some of which are easily mistaken for renal stones. And lastly (3) shadows outlining the kidney in part or entirely. Shadows caused by renal tuberculosis are not always easily recognized without clinical and cystoscopic data.

Pyelography is occasionally of great value in the diagnosis of renal tuberculosis and in the interpretation of these shadows. No one of course, will use pyelography where a diagnosis can be made without it, but I do think that occasionally it has considerable value in the diagnosis of renal tuberculosis. We have not used tuberculin to any great extent in the treatment of renal tuberculosis.

Probably the best commentary on the non-operative treatment of renal tuberculosis is given by an article of Wildbolz, in which he reviewed his experience with three hundred cases of carefully observed renal tuberculosis so treated. He found that a considerable number of patients with renal tuberculosis lived for five years following onset of the disease, but after ten years but few were alive, and in fifteen years they were all dead.

Operation with bilateral renal tuberculosis is not indicated unless the disease in one kidney is very much more advanced than the other. If there is only a slight difference I fail to see the value of an operation.

Dr. J. A. C. Colston, Baltimore, Md.: In reply to the question about the terminal phase of renal tuberculosis, I do not wish to convey the impression that the majority of cases progress to the type of partially or entirely calcified kidney, which I have described. There is no doubt I think that most cases of renal tuberculosis do progress to a total destruction with conversion of the kidney into a pyonephrotic sac and that the calcified kidneys are distinctly in the minority, although not a rarity.

Dr. E. L. Young, Jr., Boston: I wanted to emphasize the importance of the tuberculin treatment in bilateral renal tuberculosis. Last week I got an answer from a patient that I had not heard from for three years, after having treated that patient for two years with tuberculin. It was a case of definite bilateral tuberculosis, one side a little worse than the other, and it seemed to me absolutely out of the question to take out the worst kidney. Her symptoms improved. At the end of two years she disappeared from sight, and the other day she wrote saying that so far as she could tell she was well, and aside from the regular hygiene and tuberculin for two years there has been no other treatment used. The last I saw of her to examine her the urine still contained pus, and the guinea pig inoculation was positive.

Someone asked the question if there was any other ending of renal tuberculosis. A little while ago I took out a tuberculous kidney in which the kidney tissue was almost entirely replaced by a fatty fibrous tissue. It was almost a symptomless kidney. There were still one or two small foci of activity, and in looking up the literature I found one or two other cases reported in which the kidney had been replaced by a fatty fibrous tissue, the kidney tissue itself being gone entirely, a true autonephrectomy.

CONGENITAL OBSTRUCTION OF THE POSTERIOR URETHRA[1]

HUGH H. YOUNG, WILLIAM A. FRONTZ AND JOHN C. BALDWIN

From The James B. Brady Urological Institute and The Harriet Lane Home, The Johns Hopkins Hospital, Baltimore, Maryland

An obstruction more or less complete, due to the presence of abnormal valves or folds in the posterior urethra has occasionally been described in the literature. The condition has always been regarded as one of great rarity. The great majority of the cases has been recognized only at autopsy, the diagnosis made during life having had no relation to the lower urinary tract. On reviewing the records of The Johns Hopkins Hospital, twelve cases not previously reported have been found, in which the diagnosis has been confirmed by instrumental methods, operation or autopsy. It seems probable, therefore, that the condition is considerably more frequent than would be inferred from the attention given it in the past.

The earliest mention of the condition found in the literature is in the work of Langenbeck on Lithotomy, published in 1802. Thirty years elapsed before the subject was again referred to by Velpeau (1832), who described several anatomical specimens in which there were present in the posterior urethra valve-like folds which he felt might be of clinical importance. Tolmatschew, in 1870, was the first to give a comprehensive discussion of the subject and recognized the condition as a pathological entity. But these were all chance autopsy findings and it was not until 1912 that the first clinical diagnosis of valvular obstruction of the posterior urethra was made, this case being operated by one of us at this hospital. This and three other similar cases were reported before the Johns Hopkins Medical Society in November, 1913.

[1] Read at the meeting of the Association of Genito-Urinary Surgeons at Atlantic City, New Jersey, June, 1919.

Since then the development of the X-ray and renal function tests has made possible more accurate diagnosis before operation. In one of our cases (no. 5), the X-ray was used to confirm the diagnosis and to locate more accurately the point of obstruction. An operation was successfully carried out. This case was reported before the Johns Hopkins Medical Society in November, 1913. Another patient (no. 9) came to the hospital for the cure of a second degree hypospadias. The alarmingly low renal function as determined by phenolsulphonphthalein suggested a further investigation which resulted in the diagnosis of congenital obstruction of the posterior urethra which was confirmed later at operation.

THE CONDITION AS A CLINICAL ENTITY

Etiology. An inquiry into the etiology of any congenital defect naturally suggests an investigation of the embryologic development of the part in question as well as a study of the anatomical variations, which may occur within normal limits. It is interesting therefore in reviewing the literature of the subject to find explanations based upon these two possibilities. Thus Tolmatschew (23) whose article appeared in 1870 and who was the first to investigate carefully the pathology of the condition placed great importance upon the folds and ridges which are normally present in the urethra and explained the enlarged folds by assuming them to be simply overgrowths of these anatomical structures. Lindeman (8), in 1904, and Wilckens (11), in 1910, both inclined to this same view. Englisch has also recognized the frequent occurrence of folds arising from the anterior and posterior aspects of the verumontanum which are normally present and only assume a pathological rôle when they reach a height sufficient to obstruct the outflow of the urine. This view was apparently generally accepted until the appearance of Bazy's (17) article in 1903 in which he contended that the urogenital membrane of the embryo would occupy in the later stages of development a position corresponding to the most frequent site of the valves in question. He believed therefore that these valves were in reality a persistence of this membrane. Thompson

(10), in 1907, accepted this view and amplified it somewhat, likening the valves to an imperforate hymen or persistent anal membrane. Lederer (14), in 1911, and Knox and Sprunt (13) in 1912 also inclined to the embryological explanation of these structures. More recently Lowsley (7) has advanced a view based upon his studies of the embryology of the prostate and microscopic examination of his specimen of congenital obstruction. While agreeing with neither of the foregoing opinions, his explanation has points of similarity with both. He feels that the condition is an anomaly of the Wolffian and Müllerian ducts. He says:

> These structures, which in the male become the ejaculatory ducts and the utriculus prostaticus, enter the prostate near its base and course in an oblique direction through that organ until they approach the urethra, at which point they turn and for a short distance run parllael with its axis, finally opening into its lumen. During their passage through the prostate their musculature is bound together by a very definite, firm sheath of connective tissue. On their approach to the urethra they push the floor of that structure up into a mound forming the verumontanum and still are separate from all other structures, their tissues being superimposed upon those of the urethra. Ordinarily, immediately below the openings of the ejaculatory ducts and utricle, the tissues surrounding them become distributed among the fibers on the floor of the urethra. Thus the verumontanum gradually becomes smaller and smaller until just below the apex of the prostate it disappears completely, spreading out laterally in the form of little bands which disappear on the floor or walls of the urethra. In the specimen under consideration, although a number of fibers are disposed in the usual manner, the majority of them continue downward on the floor of the urethra. At the point where the verumontanum usually disappears, these fibers attach themselves to the entire circumference of the urethra, with the exception of a small portion of the floor to the left of the median line, thus producing an a most complete blocking of the urinary passage.

In our opinion none of the views outlined above adequately explains the development of *all* the types of obstruction reported. It is possible that the explanation suggested by Lowsley may account for certain of the varieties of valve-formation found

below the level of the verumontanum, particularly those arising from the bifurcation of the ridge which originates from the anterior aspect of this structure. To us a far more probable explanation is suggested by an illustration in a recent article by Watson (28) entitled "The Structure of the Verumontanum." This is a photograph of a transverse section through the urethra

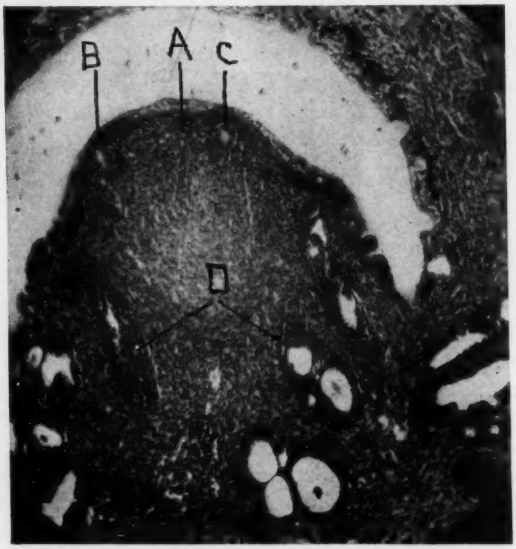

FIG. 1. TRANSVERSE SECTION THROUGH VERUMONTANUM OF SIXTEEN WEEKS' OLD FETUS

Showing normal relations of verumontanum to the roof of the urethra. From article by Watson, The structure of the verumontanum, Jour. Urology, ii, October, 1918.

at this level in a 14 weeks' old fetus. Arising from the summit of the verumontanum are three fibrous strands which are attached to the roof of the urethra. It seems highly probable that this anomaly represents an early stage of this type of valvular obstruction. This anomaly, however, seems wholly inadequate in accounting for the origin of the valve-like obstruction at the vesical neck which arises from the bifurcation of the ridge which

springs from the upper aspect of the verumontanum, as well as the semicircular folds in the roof or the floor which may occur at any level. The anatomical view advanced by Tolmatschew may explain the former variety while the embryological explanation suggested by Bazy appeals to us as very probably accounting for the occurrence of the semicircular diaphrams which

FIG. 2. TRANSVERSE SECTION OF VERUMONTANUM OF 14 WEEKS' OLD FETUS

Showing fibrous strands connecting tip of verumontanum with roof of urethra. From article by Watson, The structure of the verumontanum, Jour. Urol., ii, October, 1918.

are attached to the urethra throughout half of its circumference and the iris-like variety of Jarjavay.

An analysis of the cases of congenital obstruction which are available for study shows that the majority come under observation during infancy or early childhood. Thus, of 34 cases, in which the age is noted, 12 were under one year; 9 from one to five years; 4 from five to ten years; making a total of 25 under ten

years as against 9 above that age. The earliest case is that of Fuchs who noted the condition in a five months' fetus, while the eldest, a man of eighty-five years, was reported by Iverson.

PATHOLOGY

It seems fitting in this connection to consider first the types of congenital obstruction of the posterior urethra. In 5 of our cases

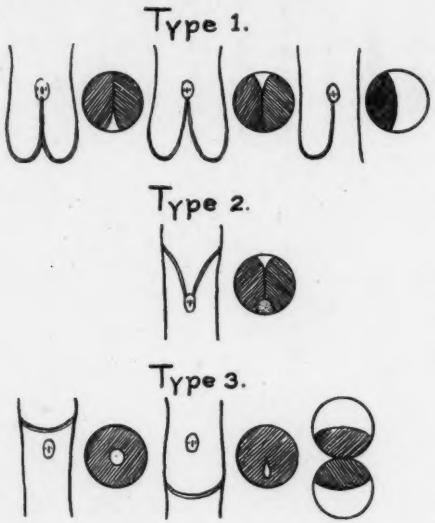

FIG. 3. DIAGRAMMATIC SKETCH SHOWING VARIATIONS OF THE THREE TYPES OF CONGENITAL OBSTRUCTION OF THE POSTERIOR URETHRA

a study of the anomaly was made post mortem, while in 7 others the condition was recognized during life, although in only 3 of these cases was any accurate information obtained regarding the exact type of the obstruction by instrumental examination. A study of the cases reported in the literature proves quite definitely that three general types of valve formations exist.

Type I. In the most common type there is a ridge lying on the floor of the urethra, continuous with the verumontanum, which takes an anterior course and divides into two fork-like

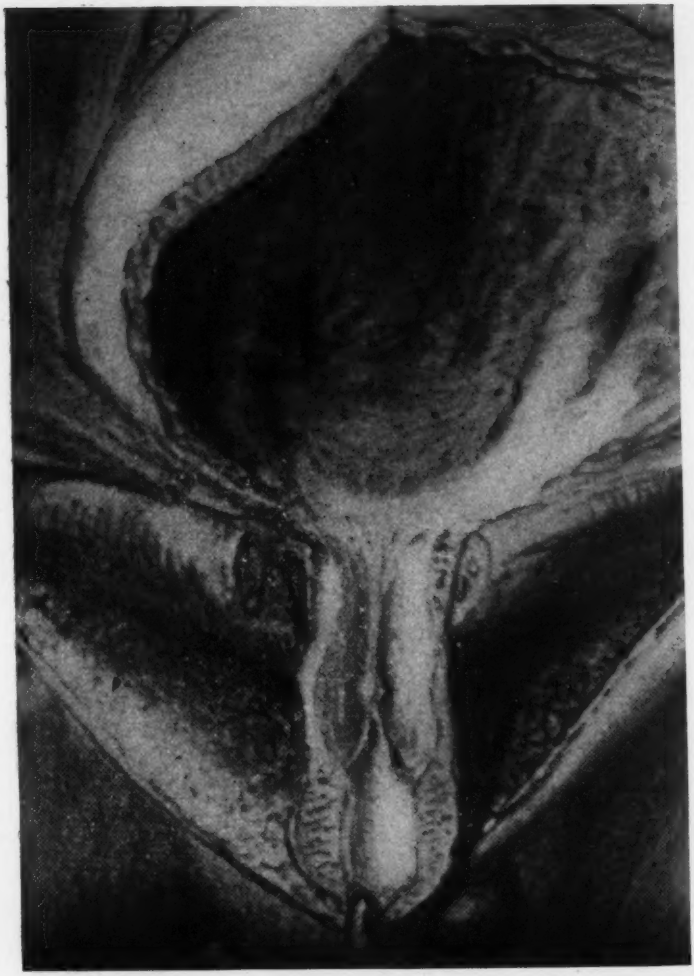

FIG. 4. ENLARGED PHOTOGRAPH OF DRAWING FROM ARTICLE BY KNOX AND SPRUNT

(See Amer. Jour. Dis. Child., lx, 1912.) Showing more in detail the situation and nature of the valvular obstruction. See case 15.

processes in the region of the bulbo-membranous junction. These processes are continued as thin membranous sheets, directed upward and forward which may be attached to the urethra throughout its entire circumference. In the majority of cases of this general type the fusion of the valves anteriorly is not complete, there existing at this point a slight separation of the folds. However, in a few of the cases of which Lowsley's and

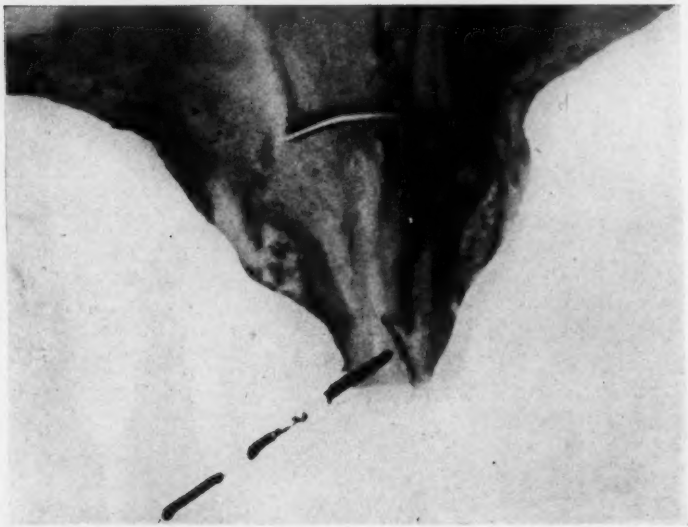

FIG. 5. ENLARGEMENT OF LOWER PORTION OF FIGURE 8

The obstruction shown is a variation of the type which is usually bilateral and springs from the bifurcation of the crista urethralis (type 1).

Knox's and Sprunt's are examples, the anterior fusion is complete while a cleft exists between the folds posteriorly. Another subdivision which really belongs to this general type consists of but a single instead of a double valve.

Type II. In the second general type of which we have one example, there occurs a more or less cylindrical ridge similar to that found in the preceding type with the exception that it passes

from the upper aspect of the verumontanum toward the internal sphincter where it divides into two fork-like processes which are continued as membranous sheets which are attached to the urethra just outside the internal sphincter in a manner similar to that described in the foregoing type.

Type III. There is a third type which has been found at different levels of the posterior urethra and which apparently bears no such relation to the verumontanum as the types just considered. This was first mentioned by Jarjavay who described it as an iris valve because of the similarity in shape to the iris of the eye. This obstruction was attached to the entire circumference of the urethra, there being a small opening in the center. Incomplete varieties of this type have been described, the most common being a more or less crescentic or semicircular

TABLE 1

Type of obstruction

TYPE	OUR CASES	CASES FROM LITERATURE	TOTAL
I	5	14	16
II	1	0	1
III	3	6	9

fold crossing the urethra and being attached either to the roof or floor.

The grouping of the cases according to this classification is indicated in table 1. In two of our cured cases and in the two from the literature the exact type was not determined, while in two other cases from the literature classification is impossible.

It should be borne in mind that varying degrees of congenital obstruction may exist, which may result in symptoms so slight that the condition is unrecognized. The occurrence of infection not infrequently results in a marked increase of obstruction in these cases, symptoms of the condition dating from this time. The recognition of a congenital obstruction late in life in an individual giving the history of only slight obstructive symptoms till a short time before, is most readily explained on this basis. It seems probable furthermore that even in the absence of

infection the obstruction in many of these milder cases may increase by the development of pockets or shallow diverticula behind the partially obstructing valves.

An interesting feature of these types of urethral obstruction concerns the arrangement of the folds which frequently offer little or no impediment to the passage of fluid or instruments from without inward but which reduces greatly the calibre of the urethra during urination. The concave surfaces of the valves are always directed toward the bladder and are ballooned out by the urinary stream. It should be noted in this connection, however, that except in those cases where only slight obstruction exists that the valves are continually ballooned out, at least when the patient is in an erect posture. In practically all cases in which the obstruction to urination is at all marked, the urethra above and the internal sphincter are greatly dilated, in consequence of which, the urethra behind the obstruction is always more or less urine filled.

The changes in the urethra above the valve differ very little from those resulting from any urethral stenosis except that they are frequently more pronounced because of the long duration and degree of the obstruction. There is always more or less dilatation of the urethra and internal sphincter and in certain of the cases a marked hypertrophy of the longitudinal urethral musculature is evidenced by cord-like bands passing from the point of obstruction to the bladder. In cases of long standing obstruction, shallow diverticula may be present in the prostatic furrows and the ejaculatory ducts and utricle may be widely dilated. These changes have been quite prominent in two of our cases.

The bladder invariably shows a marked grade of hypertrophy which may be present with or without dilatation. The variation in the bladder capacity depends apparently upon several factors. It has been noted, for instance, in the infants of our own series, as well as in several cases reported that the bladder capacity varies inversely as the degree of hydroureter and hydronephrosis. In other words in the cases in which the kidneys and ureters communicated with the bladder cavity by large orifices, the bladder was usually contracted. In the beginning of the obstruction,

however, the degree of vesical dilatation may have been marked but a free communication with a dilated upper urinary tract would explain on mechanical grounds the small hypertrophied bladder. In no case in our series and in none of the reported cases coming to our notice have vesical diverticula been found.

The changes in the ureters and kidneys warrant only brief mention as they differ in no particular from those resulting from any urinary obstruction of long standing. Extreme grades of hydroureter are seen frequently, the ureters approaching or exceeding the intestines in size. Corresponding changes are likewise noted in the kidneys. It is interesting to note that the degree of dilatation of the ureters and kidneys is rarely uniform on the two sides. In the literature as well as in our own cases, the left ureter and kidney very frequently showed the greater dilatation.

Symptomatology. That the symptoms of congenital obstruction of the urethra have not been clearly recognized is evident from the large percentage of cases in which the true condition has been unsuspected until autopsy. Yet the symptom complex is after all reasonably clean cut. Systematically considered the symptoms may be classed under four heads:—

a. Local symptoms due directly to the obstruction. These are incontinence, dysuria and retention. The incontinence frequently dates back to birth, the story being that the child has always urinated every half hour or so, or has dribbled urine constantly. This incontinence is often combined with crises of retention lasting many hours. Retention may occur alternately with incontinence, or it may be an outstanding symptom. In Bednar's case for example, the infant passed no urine for the five days he was under observation before death.

b. Symptoms resulting from dilatation of bladder, ureters and kidneys. By far the most common complaint in these cases is "distended abdomen." It is present in practically all of the carefully observed cases. The dilatation of the urinary organs causes discomfort, which may amount during periods of retention to very severe pain. Dyspnea is common from the increased intra-abdominal pressure.

c. Symptoms resulting from renal destruction. These are those of chronic diffuse nephritis. The patient may show edema, though this is not an early or a constant finding in infancy or early childhood. Anemia is usually present. Diarrhea and vomiting may be so prominent that the case is regarded for a time as a primary intestinal disturbance. These intestinal symptoms are certainly of toxic origin. In one of our cases acidosis was marked, probably the result of renal insufficiency. Uremia as a terminal picture was present in several of the cases.

d. Symptoms due to infection. Sooner or later most of these patients develop an infection of the urinary tract. It is interesting to note that in several of the cases the underlying obstruction was first recognized when there was superimposed upon it an infection. Those patients with infection show as a result of it pallor, anorexia, loss of weight and strength and fever which is apt to fluctuate rapidly and is frequently accompanied by chills. It is furthermore to the infection that the leucocytosis in these cases must be attributed.

To summarize, the symptoms are those of a local obstruction in the urethra combined with the consequent symptoms of urinary back pressure and infection.

In but few of the cases reported have the symptoms been clearly indicated. However, grouping such as are given (see table 2) shows that some disturbance of urination has been most frequent. Where vomiting, abdominal distention, and loss of weight have been prominent, the patient has been in infancy or early childhood.

Diagnosis. A review of the literature of congenital obstruction of the posterior urethra discloses but two cases in which a confirmed diagnosis was made during life. So far as we are aware, with these exceptions all of the reported cases have been discovered post mortem. This fact is quite surprising in view of the comparative frequency of the condition, the invariable history of obstructive symptoms since birth and the ease of diagnosis by the application of modern methods. It seems advisable, therefore, to consider the following points in diagnosis.

a. The history. A careful clinical history is the first indispensable step to correct diagnosis. The symptoms which are more or less characteristic of those resulting from obstruction to the outflow of urine will be somewhat modified by the degree of that obstruction and the age of the patient. In infants and very young children with severe grades of obstruction, incontinence of urine is a very common symptom, the incontinence being naturally the paradoxical variety. In many of these cases the history of abdominal tumor resulting from a distended bladder or hydronephrotic kidney may be elicited from the parent. In the less severe grades of obstruction hesitancy, the passage of a small,

TABLE 2

Symptoms

	OUR CASES	CASES FROM THE LITERATURE	TOTAL
Abdominal distention	2	3	5
Vomiting	3	1	4
Loss of weight	2	2	4
Urinary			
Difficulty	4	6	10
Pain	4	2	6
Incontinence	1	4	5
Retention	3	1	4
Frequency	3	0	3
Pyuria	1	1	2
Hematuria	0	2	2

weak stream, diurnal frequency of urination and nocturnal enuresis are commonly met with. Indeed, the presence of any symptoms suggesting urinary obstruction in a male child or young adult, particularly when the urine is uninfected, should immediately call attention to the possibility of some congenital urethral defect.

b. Abdominal palpation. The changes in the bladder and upper urinary tract resulting from urethral obstruction are demonstrable in many of these cases by abdominal palpation. In the more marked types of obstruction, particularly in those cases having incontinence, the bladder can frequently be

felt as a hard, conical or pear shaped tumor, extending as high as the umbilicus. In one case reported a diagnosis of sarcoma was made. In this type of case it is possible frequently to palpate the ureter as a large doughy mass extending from the bladder to the costal margin in which region an hydronephrosis is frequently palpable. Owing to the emaciated condition of many of these patients, abdominal palpation is greatly simplified and frequently furnishes the examiner with very valuable data.

c. Instrumental examination. The use of the cystoscope and urethroscope is naturally quite limited because of the fact that the majority of these cases when first seen are either infants or very young children. A small catheter, however, can usually be passed and an obstruction occasionally demonstrated in the region of the external sphincter. In the majority of these cases, however, little or no difficulty is encountered in passing a catheter but the ease of instrumentation is by no means an index of the degree of urinary obstruction. As indicated above, many, if not the majority, of these cases exert a valve action which operates from within outward, the valve flaps being ballooned out during the passage of urine or forming pockets in which the instrument may lodge if retrograde catheterization is attempted during operation. In very young infants a no. 5 or 6 ureteral catheter may be employed, a fine wire stylet considerably facilitating its introduction in difficult cases. Residual urine in variable amounts is recovered by the catheter. We have been able in some cases in which there was considerable destruction of the upper urinary tract to obtain a rough idea of the degree of hydroureter and hydronephrosis. With the patient in the prone position the catheter is passed into the bladder, its complete emptying being facilitated by gentle pressure over the suprapubic region. This urine is carefully measured and the amount of bladder residual recorded. Pressure is now made over one kidney and ureter, the amount of urine recovered from the catheter roughly estimating the capacity of this ureter and kidney. Pressure is finally made over the second kidney and ureter, and the output determined in a similar manner.

Cystoscopy furnishes little information regarding the type of urethral anomaly. The presence of residual urine, trabeculation, diverticula and dilated ureteral orifices, however, is proof positive of vesical obstruction. Dilatation of the internal vesical sphincter and prostatic urethra to the point of obstruction is also usually demonstrable. The use of the urethroscope or better still, the cysto-urethroscope, as it permits of urethral irrigation, enables one to obtain an excellent view of the obstruction in certain cases. It was possible in one of our cases to demonstrate without question its valve-like character. The changes incident to urethral obstruction are frequently demonstrable in the urethra above the point of narrowing. Thus, in our cases more or less dilatation was noted and in certain instances of long standing obstruction pouch formation may be found in the prostatic furrows and a widening of the diameter of the ejaculatory ducts and utricle.

Cysto-uretero-pyelography furnishes a far more accurate means of determining the degree of destruction of the upper urinary tract and is also valuable in determining the point of obstruction in young children in whom cystoscopy and urethroscopy are impossible. In many of the cases with hydroureter and hydronephrosis, the ureteral orifices are widely dilated and fluid introduced into the bladder passes into the kidney without difficulty. Thus in one of our cases where fluid was introduced into the bladder filling it to its capacity the patient complained of no sense of discomfort suprapubically, his symptoms being referred to the region of the kidneys. It is thus possible in many cases to secure valuable information by means of the X-ray. After the urinary tract has been emptied as completely as possible, 10 per cent thorium citrate or some other suitable medium is introduced through the catheter by gravity and the X-ray taken. Satisfactory filling of the upper urinary tract is frequently facilitated by having the patient in a moderate Trendelenburg position. This procedure can be carried out with perfect safety and much of the discomfort following the introduction of the thorium obviated by syphoning it off and irrigating with plain water.

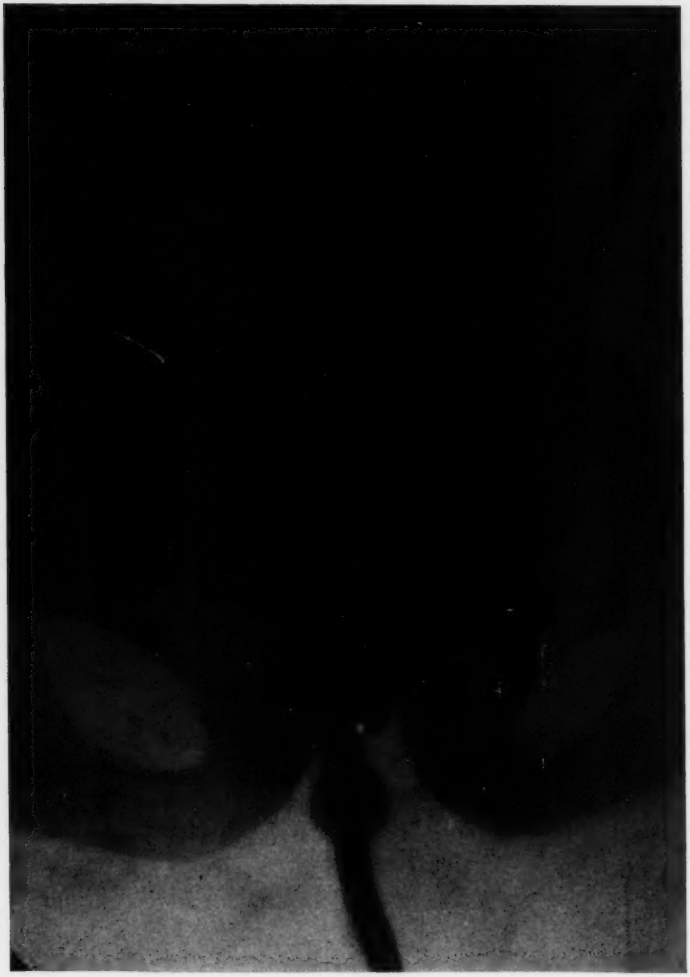

FIG. 6. ENLARGEMENT OF THE LOWER PORTION OF FIGURE 9

Showing the dilatation of the internal sphincter and urethra to the point of obstruction.

Table 3 gives the more important clinical observations with the frequency of their occurrence. The case records are frequently lacking in this respect, so that the data is far from complete.

Preliminary treatment. As many of these cases present marked grades of renal destruction, the renal function should be determined in each case and, in the event of marked renal impairment, a preliminary treatment not unlike that carried out in prostatic obstruction should be instituted immediately. This is particularly indicated in case a suprapubic or perineal operation is contemplated. Catheter drainage of the bladder and the forcing of fluids is followed invariably by marked improvement in the

TABLE 3

Clinical findings

	OUR CASES	CASES FROM THE LITERATURE	TOTAL
Distended bladder	5	11	16
Residual urine	7	1	8
Reduced renal function	6		6
Pyuria	7	4	11
Obstruction to catheter	6	5	11
Urethroscope shows obstruction	3		3
X-ray shows obstruction	2		2

renal function and the operative risk is greatly diminished. In all cases in which a retention catheter is employed, scrupulous care regarding antisepsis should be observed. Frequent bladder irrigations and the introduction of 10 per cent argyrol through the catheter will prove very helpful. During the course of the preliminary treatment, the improvement in renal function is best followed by means of phenolsulphonphthalein. These tests should be carried out at least twice weekly. Not infrequently in these cases, as is true in any type of urinary retention, the renal function may be lowered temporarily following the institution of catheter drainage. It will gradually improve, however, finally reaching a level beyond which it will not pass. When this highest level is reached and the percentage output of phenolsulphon-

phthalein is constant as shown by repeated tests, operation may usually be safely carried out, irrespective of the degree of renal destruction.

Treatment. In the surgical treatment of congenital obstructions of the posterior urethra, three avenues of approach immediately suggest themselves. The selection of the method to be employed in a given case will vary somewhat with the age of the patient and the personal preference of the operator.

1. Intraurethral procedures. In the removal of congenital obstructions of the posterior urethra, several methods are available. For convenience of description they may be divided into (a) instrumental; (b) urethroscopic; (c) excision with Young punch instrument.

a. Instrumental. In certain cases, an obstruction in the posterior urethra is encountered on attempting to introduce an instrument into the b'adder. Particularly is this true in those cases in which the fusion of two valves is almost complete. It may be possible in certain cases to remove the obstruction by forcibly passing a metal instrument through it. This plan of attack has been carried out successfully in two of Bazy's cases by means of a sound, while in one of our cases it was accomplished with a straight urethroscope. In other cases a filiform may be introduced after which the passage of followers of large size may result in the destruction of the valve. In certain others it may be advisable to divide the obstruction with a Maissoneuve urethrotome to be followed by high urethral dilatations.

b. Urethroscopic methods. This plan of attack is necessarily limited as in a relatively small proportion of cases is satisfactory urethroscopy possible. In cases in which the urethroscope can be passed, it may be possible to divide or remove the valve more or less completely with suitable scissors. The disposition of the valve, however, may make this procedure impossible in which case its free edge may be grasped by a urethral rongeur and forcibly torn from its attachment. The obstruction may also be destroyed by fulguration in certain cases. The difficulty of the methods just outlined is at once apparent when it is recalled that upon the passage of the instrument the valves may be

pushed aside so that they lie against the urethral walls. These difficulties can usually be overcome by the following procedure:

c. Excision with Young punch instrument. The technique we have employed in two of our cases successfully treated by this means is as follows: The bladder is first filled to its capacity after which the "punch" is introduced. The obturator is now removed and the instrument slowly withdrawn. The dilated condition of the urethra above the point of obstruction will permit a certain amount of fluid to pass by the instrument thus inflating the valve which will be caught in the fenestra. The knife is now ntroduced and the obstruction excised. In case the obstruction is bilateral as is frequently the case a second cut may be made. The ease and certainty of this method will be greatly facilitated by a previous knowledge of the position and character of the obstruction, but as most of these cases are children this method is not often applicable.

2. Suprapubic operations. The treatment of these cases through a suprapubic cystotomy can usually be accomplished without difficulty although the method employed may vary somewhat with the position of the obstruction. When this lies above the level of the verumontanum, it may be readily removed by rongeur, scissors or cautery. For those cases in which the valve lies at a lower level, and the most common location for this type is in the region of the external sphincter, its destruction may be accomplished by passing a sound from above downward into the pocket of the valve and forcibly tearing through it. Thus in one of our cases (case 5) in which the valve lay just outside the internal sphincter it was readily destroyed by the electro-cautery. In another case (case 3) located in the mid-prostatic portion the obstruction was readily broken through with the finger. In a third case (case 6) in which the valve occupied the position of the external sphincter its destruction was easily accomplished by a sound, while in another (case 9) the obstruction was removed by means of a rongeur.

3. Perineal method. The patient is placed in an exaggerated lithotomy position and a "seminal vesical tractor" introduced into the posterior urethra which facilitates the exposure of the membranous urethra and the posterior surface of the prostate,

as in conservative perineal prostatectomy. After exposure of the membranous urethra the tractor is carried into the bladder, opened and the prostate is brought down into the field by traction and its posterior surface exposed by pushing back the posterior layer of Denonvilliers fascia and the levator muscle. Incisions are now made through the posterior surface into the urethra on either side of the mid-line, with an inverted V-incision beginning in the region of the apex and taking a slightly divergent course for a short distance above the level of the verumontanum. This triangular flap is then carried back with the floor of the urethra and an excellent view obtained (see plates 1 and 2). If exposure of the urethra between the verumontanum and the bladder is desired, the incisions in the prostate can be carried further toward the internal sphincter. The exposure thus obtained will greatly facilitate the complete removal of the obstruction, following which the prostatic flap is replaced and secured by sutures. A retention catheter is then introduced through the urethra and the perineal wound drained by a single strip of gauze. This operation has been carried out by Young and Geraghty in verumontanitis cases.

Results. The functional results of operation in cases of congenital obstruction of the urethra are very satisfactory but the prognosis in a given case will depend naturally upon the changes in the upper urinary tract subsequent to back pressure and infection. In young children in whom the obstruction is not extreme and the renal damage relatively slight the outlook is most encouraging. In our series extreme grades of renal destruction have been present in all of the adult cases and while operation has been followed by improvement both in renal function and in general health, the ultimate prognosis in these cases is generally bad.

In a small percentage of cases the radical removal of these obstructions will be followed by urinary incontinence, irrespective of the avenues of approach selected. The occurrence of this distressing condition will depend upon the degree of obstruction present but chiefly upon the duration of that obstruction. In other words, it is actually dependent upon the degree

of pressure atrophy of the internal sphincter and urethral musculature. This is invariably more pronounced in adults and the possibility of post-operative incontinence should be very carefully considered in these cases. Thus, in one of our patients, aged twenty-four, in whom removal of the obstruction was carried out with the "punch," the operation was followed by incontinence while in another, aged forty-two, having as severe a grade of obstruction and presenting even greater urethral and sphincteric dilatation back of the stricture, the removal of but one valve was followed by perfect urinary control.

CASE REPORTS

In the following cases the diagnosis of congenital obstruction of the posterior urethra was made before operation, at operation or at autopsy. The case histories are given herewith in the order of age.

Case I. This patient was born February 18, 1916, and when eleven days of age was seen in the Dispensary of the Harriet Lane Home where the examination, save for the fact that he was undersized, was negative. He returned one month later with a complaint of vomiting and it was noted at the time that his abdomen was distended. Upon the next visit the mother reported that the child had not voided for two days. The bladder could be definitely felt as a hard, rounded mass extending half-way to the umbilicus. An unsuccessful attempt was made to pass a catheter. On April 11, 1916, because he was losing weight and seemed quite ill, he was admitted to the hospital. The rib margins flared and a remarkably symmetrical distension of the abdomen, especially in the upper part, was noted. No masses were felt. A rectal tube was passed and some flatus expelled. An X-ray examination, after a bismuth meal, showed a normal gastro-intestinal tract. For five days after admission he seemed to improve, gaining five ounces in weight. On April 17, however, the distension increased, the breathing became labored and an exploratory laparotomy was carried out. A mesenteric cyst was discovered and removed and a cyst of the urachus was left in situ. Following the operation the infant took his feedings badly, so was fed by gavage. The respirations became very deep, suggesting acidosis and 60 cc. of 4 per cent sodium bicarbonate solution

was given into the longitudinal sinus with marked improvement in respiration. The same day the patient was transfused, receiving 45 cc. of the mother's blood. Following this the temperature rose rapidly to 106°; the patient developed convulsions and died.

Autopsy. The bladder was not dilated but its walls were greatly hypertrophied, measuring 9 mm. in thickness. It was moderately trabeculated and the ureteral orifices while not widely dilated were larger than normal. On attempting to pass a probe through the urethra from above downward, an impassable obstruction was met at the prostato-membranous junction. Upon passing it in the opposite direction, however, no obstruction was encountered. The internal sphincter was widely dilated, measuring 6 mm. in diameter. The anterior wall of the entire urethra was now opened. The prostatic urethra showed considerable dilatation which, however, ended abruptly at its junction with the membranous urethra. The verumontanum was more prominent than normal and springing from its anterior aspect and continuing down the mid-line of the urethral floor, was an hypertrophied ridge which bifurcated at the prostate apex to be continued as membranous folds closely adherent to the urethral wall. These fused in the mid-line anteriorly but a tiny opening was present on the posterior wall (see plate 3). Both kidneys were slightly lobulated, the left soft and fluctuant. The right kidney showed a slight grade of hydronephrosis and the right ureter measured $\frac{3}{4}$ cm. in diameter. The left kidney showed a rather marked hydronephrosis and its ureter was elongated, tortuous and dilated, measuring 1.5 cm. in diameter.

Case II. The patient was brought to The Harriet Lane Dispensary on October 15, 1917, at which time he was three months of age. He was well developed and well nourished and seemed normal physically. He lost weight rapidly, developed a cough, vomited and was admitted to the hospital. The urine showed pus and B. coli. He died soon after admission.

Autopsy. At autopsy the chief points of interest centered about the genito-urinary tract. Both kidneys were slightly enlarged and showed on section slight hydronephrosis. Both ureters were also dilated and tortuous. The bladder was small but its wall was considerably thickened. No obstruction was found at the vesical orifice which appeared to be somewhat dilated. On passing a probe into the urethra from the bladder, an obstruction was encountered in the region of the verumontanum which was passed with some difficulty. No obstruction, however, was evident when the probe was passed in the opposite di-

rection, thus demonstrating the valve-like nature of the obstruction, as is usually seen. The verumontanum was especially prominent, quite firm and hard. The urethra was opened in the mid-line posteriorly but no real valve or stricture was demonstrated. The specimen of this case has been lost and the above notes have been taken from the pathological record. While not conclusively evident of congenital obstruction of the posterior urethra, it seems very probable that this was the actual condition present, and that the specimen, in its removal from the body, was cut off too high up, the obstructing valves remaining behind with the membranous urethra.

Case III. This patient, aged six months, was admitted to the Harriet Lane Home on July 14, 1914. Examination revealed acute otitis media. The patient gave no history of symptoms referable to the bladder but two days after admission it was noticed that the bladder was greatly distended. An attempt at catherterization was unsuccessful because of an obstruction in the region of the external sphincter. Under local anesthesia a suprapubic cystostomy was done. Examination showed considerable dilatation of the prostatic urethra and internal sphincter. Digital palpation revealed a valve-like obstruction stretching across the roof of the mid portion of the prostatic urethra. Very little regarding the character of the obstruction could be learned. The valve was forcibly broken with the finger. The suprapubic wound healed in two months and the patient voided with perfect freedom.

Case IV. This patient, aged fifteen months, was admitted to The Harriet Lane Home on July 30, 1916. His birth was normal and the first six months of his life he did very well. At the age of six months he began to lose weight and vomited frequently. At ten months of age his physician found pus in the urine. On admission, the child was emaciated, under-developed and cried incessantly. The abdomen was soft, the bladder palpable to the umbilicus and the external genitalia normal. The examination of the blood showed a leucocytosis of 20,000 and a hemoglobin of 90 per cent. The urine was infected with the colon bacillus, contained many pus cells and a large amount of albumin. Because of the marked distension of the bladder, a no. 6 ureteral catheter was introduced with some difficulty, withdrawing a large amount of urine. The phenolsulphonphthalein test four days after admission showed an output of 0 per cent the first hour, 5 per cent for the second hour, and during the next six hours, 10 per cent was recovered. During the next two days he became rapidly worse, refused his feedings, developed hyperpnea and projectile vomiting; his temperature rose to 107° and he died.

Autopsy. The findings at autopsy were negative except for the genito-urinary tract. The right kidney was half again as large as normal and showed a moderate grade of hydronephrosis. The ureter was very much elongated, tortuous and measured from 0.5 to 2 cm. in diameter. The left kidney showed a greater degree of destruction, the pelvis was extra renal, quite enlarged and the ureter was about twice the diameter of the right. The bladder was contracted but its wall was markedly hypertrophied, measuring 1.5 cm. in thickness. The vesical orifice was quite dilated, measuring at least 1 cm. in diameter. Below this point the prostatic urethra was dilated to even a greater degree. measuring 2 cm. at its widest portion. On attempting to pass a probe from the bladder downward, an obstruction was encountered 2.5 cm. below the internal sphincter. A probe introduced through the pendulous urethra, however, passed very readily into the bladder without meeting any obstruction. The entire urethra was opened in the midline anteriorly, disclosing a remarkable condition. Just at the apex of the prostate and attached to the entire circumference of the urethra in a slightly oblique direction was a fold of tissue, quite thin and fibrous looking. This extended upward from the floor of the urethra for a distance of 4 mm., while on the lateral walls it projected into the urethral lumen for a slightly greater distance. The urethra above the obstruction extended laterally below the upper level of the valve, forming quite pronounced pockets into which the probe undoubtedly lodged when it passed from above downward (see plate 4). The prostatic urethra was quite smooth and nothing resembling the verumontanum was seen. When the urethra was closed a small, oval slit, measuring 3 by 6 mm., existed in the center of the diaphragm.

Case V. Male, aged twenty months, was admitted to the Harriet Lane Home, on August 25, 1913, with the complaint of bladder trouble. The family history was unimportant. He was a full term baby, appeared normal at birth, and did well until five months old, when it was noticed that he had difficulty and pain on voiding. This was attributed to a tight foreskin which was frequently dilated. At ten months he was said to have had typhoid fever. He was ill for five weeks. Following this, as his dysuria persisted, he was circumcised. The wound healed very slowly and the operation brought no relief. His urine at this time was "creamy" and the mother thought that at times there was a discharge of pus on his napkin after which he seemed temporarily free from pain. He had always been constipated and since eleven months of age, he had had frequent vomiting attacks.

Examination showed a pale, fairly well nourished boy with rather flabby musculature. A note made at the time was as follows: "There is a mass continuous with the bladder which extends to the level of the umbilicus. It is conical in shape and freely movable except at the apex. This mass is about 6.5 cm. broad at the base and gradually tapers to a broad, rounded margin above. On the right side, extending from the kidney region to the bladder, is a mass about 2 cm. in diameter. Corresponding to this there is a similar but somewhat smaller structure easily palpable on the left side." Several unsuccessful attempts were made to pass a soft rubber catheter, ranging in size from Nos. 6 to 9 French. In each case the catheter met with an obstruction after passing through the external sphincter. No urine came through the catheter. A filiform was readily passed into the bladder, after which an ureteral catheter could be passed. A large amount of urine was recovered in this way, which showed albumin but no casts. The output of the phenolsulphonphthalein was only a trace in the first two and one-half hours; during the next two hours there was an output of 5 per cent, while during the fifth and sixth hours, 30 per cent was recovered. A thorium cystogram showed a trabeculated bladder with some dilatation of the internal sphincter and adjacent urethra but none of the fluid passed into the ureters.

On October 3, 1913, a suprapubic operation was carried out. The bladder was found to be dilated and hypertrophied. The vesical orifice was quite dilated and just beyond it in the prostatic urethra a small vertical valve-like obstruction could be felt on the left side. This obstructed about one-half of the urethra; was more or less semicircular in outline and extended from the floor to the roof. It was readily seized with a clamp, pulled into the bladder and destroyed with electro-cautery. Further examination of the urethra showed no obstruction. It was noted at operation that pressure in either flank caused large amounts of urine to escape from the ureteral orifices although these showed no dilatation. The patient was discharged four weeks after operation, voiding with perfect ease. His general health improved rapidly, and he remained well for a year, finally dying of diphtheria.

Case VI. This patient, aged twenty-one months, was brought to the Harriet Lane Dispensary, on August 19, 1913, with an interesting history. He was the first child to be born to the parents alive, there having been three miscarriages. His birth was normal at term. He had been breast-fed for a time, then put on condensed milk. For ten

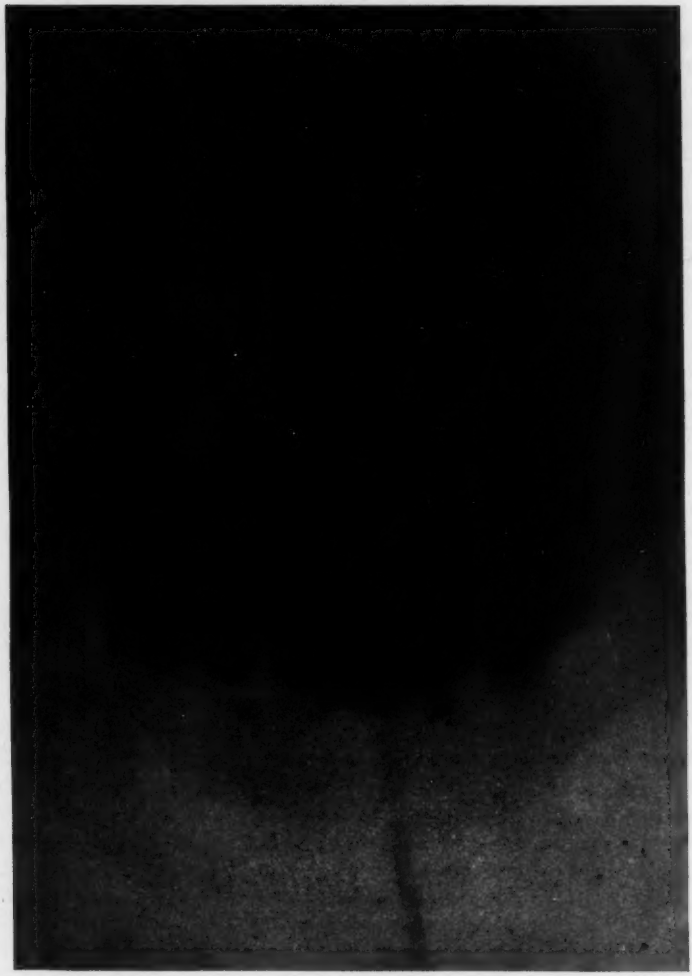

FIG. 7. CYSTOGRAM OF CASE 5

Showing the dilatation of the vesical orifice and the markedly trabeculated bladder. The obstruction in this case lay in the prostatic urethra just beyond the internal sphincter.

months before admission urination had been painful and periodically (about every two weeks) he had suffered with distention of the bladder. At such times he had been known to go for thirty-six hours without voiding. During his periods of retention he had been unable to sit up because of the pain. After being followed for two months in the dispensary without improvement he was admitted to the hospital.

Examination showed a well developed, fairly well nourished child. His bladder was distended, reaching almost to the umbilicus. Attempts to pass rubber and metal catheters failed because of an obstruction 7 cm. from the meatus. An ureteral catheter was finally passed and 500 cc. of urine recovered. The urine showed no pus but a moderate amount of albumin. The phenolsulphonphthalein test gave an output of 71 per cent the first hour and 10 per cent the second hour.

At operation on November 5 the bladder was opened suprapubically. It was found to be quite dilated and its wall hypertrophied. The vesical neck was widely dilated and the finger was readily passed a considerable distance into the prostatic urethra. When a small sound was passed through the meatus, it met an obstruction in the region of the external sphincter. When the finger was introduced through the vesical orifice the tip of the sound was found to be covered with a thin membrane. Sounds were now passed from the urethra toward the bladder but it was impossible to make the two sounds meet because of the existence of this thin membranous fold. A large probe was bent in the shape of a sound and after some difficulty it was passed from the anterior urethra into the bladder. The condition was believed to be one of congenital obstruction of the urethra and a perineal incision was made into the bulb which appeared to be perfectly normal. The point of obstruction seemed to lie somewhat above the bulb although its exact nature was not determined. The urethra beyond the urethrotomy incision was forcibly dilated with a large sound, thus rupturing the valve. Both suprapubic and perineal wounds healed in one month and the patient left the hospital with no urinary difficulty. He was lost sight of until January, 1919, when he returned to the hospital for a tonsillectomy. He had no urinary symptoms, the urine was perfectly normal and his general condition excellent.

Case VII. This patient, aged two years, was admitted to the Harriet Lane Home on January 25, 1913, for hydrocephalus. During the course of examination it was noted that the urine contained pus and albumin. No history of previous urinary symptoms was obtained. During his stay in the hospital he had periods of complete urinary

retention but was always catheterized with ease, and large amounts of urine recovered. He was last admitted to the hospital in 1916, at which time urinary retention and infection were prominent symptoms. He died on February 3, 1916.

Autopsy. The genito-urinary findings are alone of interest in this connection. The penis, urethra, bladder, ureters and kidneys were

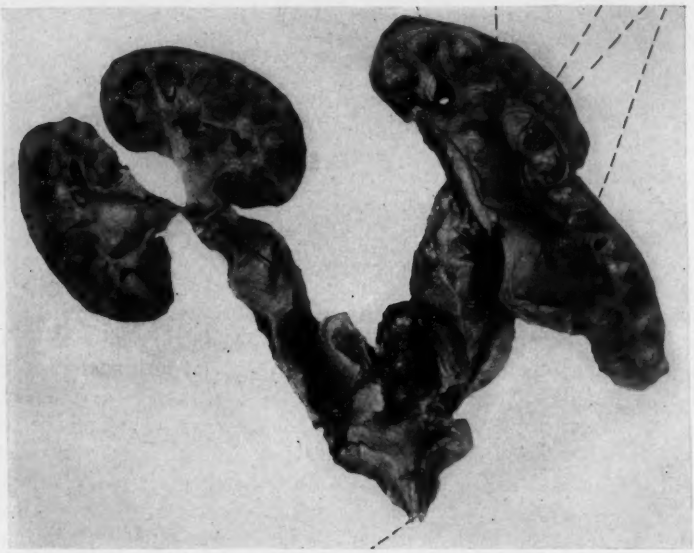

FIG. 8. PHOTOGRAPH OF SPECIMEN FROM CASE 7

Showing dilated posterior urethra, hypertrophied bladder, hydroureters and bilateral hydronephrosis. The valve causing the obstruction is shown on the left wall of the urethra near the point where it is cut off at the end of the dotted line.

removed together. On opening the posterior urethra, a remarkable condition was seen. Beginning at the internal sphincter and extending well below the verumontanum considerable dilatation was noted. From the anterior aspect of the verumontanum an hypertrophied ridge was seen coursing down the mid-line. When the region of the external sphincter was reached, this diverged to the left ending in a thin fibrous fold which was attached to the urethra throughout half of its circum-

ference. The membrane was extremely thin and its concavity directed upward so that it caused apparently considerable obstruction to urination. The bladder was quite small and contracted, and its wall considerably hypertrophied. Both ureteral orifices were only slightly dilated but as soon as they were opened up the ureters were found to be greatly enlarged. The ureteral dilatation was greater on the left, where the circumference of the ureter was 4 cm. throughout its course. The pelvis of this kidney was greatly dilated and its cortex very thin. The right kidney showed a somewhat lesser grade of destruction.

Case VIII. This patient, aged four years, was admitted December 8, 1917, with a history of having had no urinary difficulty until the age of seventeen months. At this time he was operated upon elswhere for vesical calculi. A suprapubic cystostomy was done but no calculi found. Instead, a diagnosis of vesical papilloma was made and fulgurations were carried out for a time through the suprapubic fistula. Later a portion of the bladder wall was resected and the tissue on histologic examinations found to be inflammatory. He was admitted to this clinic two years later with the history of persistent suprapubic fistula. There were two openings in the bladder of pin-head size, through which all the urine came. The child's mother said that when these closed, the patient ran a fever and had great difficulty in urinating, characterized by marked straining. Relief was obtained only by opening the suprapubic wound. On cystoscopic examination no evidence of tumor was found. The suprapubic fistulae were excised after which the bladder closed. For a short time after his return home the patient had little or no difficulty but it was not long before he had a return of the urinary obstruction with rise in temperature. In view of these symptoms it was thought probable that there was a contracture of the vesical neck which gave rise to the obstruction. Accordingly, on February 3, 1918, the bladder was opened and found to be of the size of a walnut. The vesical orifice was dilated, as was the entire posterior urethra, it being possible to introduce the index finger as far as the external sphincter. A catheter followed by a large sound was passed through the posterior urethra into the bulb. While no actual obstruction was demonstrated, it seems probable that the dilated posterior urethra was caused by a congenital obstruction in the membranous urethra and the case is therefore included in this report.

Case IX. This patient, aged twelve years, was admitted to the Johns Hopkins Hospital, May 18, 1915, with the history of difficult and frequent urination since birth. This was thought at first to be

due to a peno-scrotal hypospadias with contracture of the meatus. His general condition was negative except for a marked kypho-scoliosis. On abdominal examination the bladder could not be felt, but passing up from the bladder region to the costal margins a large, doughy, sausage-like mass could be felt on either side of the mid-line. Beneath the costal margin on either side large, soft structures, apparently kidneys, were palpable, the right being considerably larger than the left. The external genitalia were normal, except for a peno-scrotal hypospadias associated with considerable downward bending of the penis.

A small catheter was readily introduced withdrawing 700 cc. of cloudy, infected urine. Afterward the bladder was filled with fluid and a small cystoscope passed. Both ureteral orifices were markedly dilated and the bladder was quite trabeculated. No obstruction was seen at the prostatic orifice. A retention catheter was introduced. It was noted subsequently that 550 cc. of sterile water could be introduced without causing discomfort but when this amount was exceeded the patient cried out with sharp pain in his upper abdomen. A relatively small amount of this fluid was returned through the catheter and pressure over the suprapubic region did not increase the flow through the catheter. When pressure was made, however, over the kidneys and ureters the entire amount of water introduced was promptly returned.

Phenolsulphonphthalein two days after admission appeared in the urine in nineteen minutes, the output for the first hour being 15 per cent, 10 per cent for the second hour. A thorium X-ray was now made. A catheter was passed and the urinary tract emptied as completely as possible by pressure. Then 600 cc. of 10 per cent thorium citrate solution were introduced by gravity and the X-ray taken. A remarkable condition was found. The internal sphincter was quite widely dilated, measuring 1.25 cm. in diameter. The dilatation continued into the prostatic urethra for 1.5 cm., where it ended abruptly. The bladder showed a slight grade of hypertrophy and some irregularity in its contour suggesting trabeculation. Both ureters were widely dilated, the right measuring 3.5 cm. in diameter, the left measuring 2 cm. The left ureter was at least twice as long and more tortuous than the right. The right kidney showed a large, saccular hydronephrosis, measuring 12 by 8 cm. The left kidney was less dilated and measured 6 by 7.5 cm.

At operation the bladder was opened and found to be slightly dilated and considerably hypertrophied. The prostatic orifice was quite

FIG. 9. ROENTGENOGRAM MADE IN CASE 9 AFTER 600 cc. of 10 PER CENT THORIUM NITRATE HAD BEEN INTRODUCED INTO THE BLADDER BY GRAVITY

Note the dilated posterior urethra and vesical orifice, the irregular bladder outline and the distended ureters and kidneys.

dilated and the index finger could readily be passed into the prostatic urethra for a distance of 1 cm. At this point, however, a band of more or less crescentic shape extending across the roof of the urethra was found. A sound passed through the penile urethra could be made to enter the bladder with ease unless the beak was made to hug the superior wall. By means of a small rongeur the band was grasped and divided in three places. This diaphragm was quite fibrous. Subsequent histological examination showed it to consist of connective tissue and smooth muscle. After the removal of the obstruction, instruments could be passed without any difficulty.

The patient made an uneventful recovery from the operation and was discharged from the hospital in four weeks. He was voiding without the least difficulty and in a large forceful stream. Catheterization, however, recovered 150 cc. of residual urine which is explained very probably by the double hydronephrosis and hydroureter. The final phenolsulphonphthalein showed an output of 19 per cent for the first hour and 15 per cent for the second.

Case X. This patient, aged seventeen, was admitted to the hospital, November 11, 1912. He gave a history of having had difficulty since birth in passing urine, urinations having been accomplished only after several trials and marked straining. He had had to void every two hours during the day and once at night for as long as he could remember. There was no history of pain or incontinence. For nine years prior to his admission the urine was very cloudy. One month before coming to the hospital his eyesight became affected so that in reading, the printed page was blurred and objects at a distance were indistinct. There was no dizziness, no headache, no edema, no dyspnea.

On examination at the time of admission the patient was fairly well nourished, although his appearance was unhealthy and his complexion pasty and sallow. The general physical examination was negative, the positive findings being concerned only with the urinary tract.

On cystoscopy no obstruction to the passage of the cystoscope was encountered. There were 475 cc. of residual urine and the bladder capacity was 750 cc. No obstruction was found at the prostatic orifice; in fact, it was somewhat dilated. The bladder was considerably trabeculated and the right ureteral orifice widely dilated.

On examination of the urethra with the cysto-urethroscope a rather prominent ridge was seen coursing along the floor of the urethra in its mid-line between the external sphincter and the verumontanum. The ridge ended in the verumontanum which was of about normal

size. The upper aspect of the verumontanum was bifurcated and from it were continued two thin folds of tissue which were apparently attached to the floor and lateral walls of the urethra in the region of the internal sphincter. Neither ejaculatory duct could be seen but just beneath the internal sphincter there was an opening which measured, possibly, 3 mm. in diameter, which was probably a dilated utricle. Considerable pus was seen issuing from this. At a subsequent examination an attempt was made to pass a straight urethroscope but considerable difficulty was encountered in the region of the internal sphincter; a slight amount of force was used and the instrument passed into the bladder. Following this instrumentation the patient voided very much more freely; in fact, his urinary stream was about normal size. He held his urine for several hours and his former urinary symptoms largely disappeared. It seems very probable at the time of instrumentation the valve-like obstruction noted at a previous examination had been ruptured. The patient lived for a year with no return of his former urinary symptoms. He died of pneumonia.

Autopsy. The bladder was quite dilated and rather thin walled. The right ureteral orifice was quite markedly dilated, measuring at least 1.5 cm. in diameter. The right ureter was very tortuous and measured 4 cm. in diameter at its widest portion. The right kidney was a mere shell, containing apparently no renal tissue. The left ureteral orifice was well dilated, being only about a fourth as large as the right. This ureter was also quite tortuous and dilated, measuring, however, 2.5 cm. at its widest portion. The left kidney showed a considerable grade of hydronephrosis, the destruction, however, being much less marked than on the other side. The interesting feature of the post mortem study concerned the posterior urethra (see plate 5). Just beneath the internal sphincter was an opening more or less slit-like in character, passing from the lower region of the sphincter to the level of the verumontanum. On examination of the upper portion of the slit it was found possible to pass a large probe behind the bladder for a distance of 1 cm. The condition of the verumontanum was peculiar in that it was bifurcated, the concavity extending towards the bladder. From each leg of the "V" there continued upward toward the bladder a fibrous ridge which extended at least 3 mm. above the floor of the urethra. These ridges bounded the slit-like cavity noted above; they ended in the region of the internal sphincter which appeared to be quite widely dilated. On examination of the remainder of the posterior urethra only slight if any dilatation was seen. From the lower

aspect of the verumontanum and coursing along the mid-line of the urethral floor was a fairly prominent longitudinal ridge of tissue which rose from the surface of the urethra for about 1 mm. This finally bifurcated in the region of the prostatic apex and gradually disappeared. The remainder of the urethra appeared perfectly normal.

Case XI. This patient, aged twenty-six, was admitted to the hospital on March 7, 1916, with history of marked dysuria and urinary frequency for nine years, prior to which time he had no symptoms referable to the bladder. Upon examination the prostate was soft and atrophic but the seminal vesicles were enlarged and very hard. Both epididymes were enlarged, nodular and indurated. The bladder urine was infected and the renal function greatly reduced, there being but a trace of phenolsulphonphthalein appearing in the urine in two hours. Upon cystoscopy no difficulty was encountered in introducing the instrument. There were 175 cc. of residual urine. The bladder was moderately trabeculated and both ureteral orifices were normal in appearance. The internal sphincter showed considerable dilatation and the entire posterior urethra was quite dilated. The median portion of the prostate was flattened out and just in front of it were three very prominent ridges, more or less fan-like in character, which passed down the floor of the urethra ending in the verumontanum on either side of which was a rather deep pouch formation. Examination of the urethra below the verumontanum showed a large, prominent ridge passing down the mid-line for a distance of 1.5 cm. At its lowermost portion the right side of this ridge was found to be continuous with a prominent, fibrous-like septum which was attached to the urethra throughout half of its circumference. The left side of the urethra presented no such anomaly.

Operation. By means of the "punch" the septum was removed, this procedure being followed by very little bleeding. The operation, however, resulted in incontinence of urine when the patient was up and about, although when sitting or lying down, the patient was able to hold his urine from three to four hours. The urine was voided freely and in good stream. He left the hospital with 35 cc. of residual urine and a bladder capacity of 75 cc.

Case XII. Patient, aged forty-two, was admitted to the hospital, June 2, 1917, with history of urinary trouble dating from early childhood. He had always had marked hesitancy in starting the urinary stream, which was small and weak. Until the age of twenty he was constantly troubled with nocturnal enuresis and daily frequency of

urination. At the age of twenty-eight he contracted gonorrhea during the course of which he developed a urethral stricture, which was divided by internal urethrotomy, after which sounds to 40 F. could be passed. For ten years following this procedure his symptoms improved, although he still had considerable frequency and difficulty in voiding. At this time his urine became very cloudy, he had frequent attacks of chills and fever and suffered from pain in the region of the left kidney. From this time on his urinary difficulty increased; he voided at half-hourly intervals during the day and from ten to twelve times at night and as his symptoms increased he developed nocturnal incontinence. Six months before admission his bladder capacity was 1700 cc. Large sounds could be passed into the bladder but smaller instruments met an impassable obstruction in the prostatic urethra. Following the passage of sounds there was little or no improvement in his symptoms.

Upon examination at the time of admission the patient was fairly well nourished but pale and of a pasty, sallow color. Except for his uro-genital system no organic disease was made out. He was able to void a small amount of very cloudy urine in the sitting position but only after great straining. Upon rectal examination a marked prostatitis and seminal vasculitis were found and examination of the secretion expressed showed nothing but pus. Upon cystoscopy some difficulty was encountered in introducing the instrument owing to an obstruction at the mid-prostatic portion of the urethra. Upon withdrawing the instrument slightly and then greatly depressing the handle, it passed quite readily into the bladder, recovering 1100 cc. of cloudy urine. Study of the vesical orifice revealed nothing to account for the obstruction, in fact, the orifice and the prostatic urethra as far as the verumontanum showed considerable dilatation. The vesical mucosa was diffusely inflamed, there were no diverticula and the ureteral orifices were only slightly enlarged.

Further investigation of the posterior urethra with the cystourethroscope gave most interesting findings. Passing down the mid portion of the floor of the urethra between the internal sphincter and the verumontanum was a cylindrical body, apparently 3 or 4 mm. in diameter, on either side of which at about its mid portion was a shallow diverticulum. At the lower extremity of this cylindrical structure was an enlarged and globular verumontanum which at first suggested an explanation for the obstruction. Upon withdrawing the instrument farther, however, two valve-like folds were seen on either side of the

TABLE 4

Cases from the urologic and pediatric

CASE NUMBER	DATE	AGE	SYMPTOMS	CLINICAL EXAMINATION	DIAGNOSIS
1	3-1-16	11 days	Vomiting; abdominal distension; urinary retention	Distended bladder; obstruction to catheter	Abdominal tumor
2	10-15-17	3 mos.	Loss of weight and vomiting	Pyuria	
3	7-14-14	6 mos.	None until 2 days before admission, then abdominal distension	Catheter met with obstruction at external sphincter	
4	7-30-16	15 mos.	Loss of weight; vomiting	Distended bladder; pyuria. Residual urine; reduced renal function	
5	8-25-13	20 mos.	Urinary difficulty and pain	Distended bladder; palpable mass in each kidney region; reduced renal function; X-ray to demonstrate point of obstruction	Congenital obstruction posterior urethra
6	8-19-13	21 mos.	Painful urination for 10 months. Periodical attacks of retention	Distended bladder; obstruction to catheter in posterior urethra; residual urine	
7	1-25-13	2 yrs.	Attacks of complete retention	Residual urine	
8	12- 8-17	4 yrs.	Dysuria. Persistent suprapubic fistula	Pyuria; persistent suprapubic fistula (post-operative)	Contracture of vesical neck
9	5-18-12	12 yrs.	Difficult and frequent urination since birth	Large residual urine; pyuria. obstruction to catheter, posterior urethra; cystogram; reduced renal function	Congenital obstruction

—*Johns Hopkins Hospital*

TREATMENT	OPERATIVE FINDINGS	AUTOPSY FINDINGS	RESULT	REMARKS
ratory laparot-y	Mesenteric and urachus cysts	Division crista urethralis below verumontanum into 2 valves	Dead	
		Specimen destroyed	Dead	
apubic cystostomy th rupture of ve in posterior thra with finger	Valve in mid portion prostatic urethra		Well	
		Two valves below level of verumontanum	Dead	
apubic cystostomy h destruction of ve; clamp and tery	Just below vesical orifice vertical valve on left side		Well	Died 1 year later of diphtheria
apubic cystostomy h external urethrotomy, with rupre of valves; nds	Three membranous folds below verumontanum		Well	
		One valve below verumontanum springing from lower end crista urethralis, left side	Dead	
apubic cystostomy h passage of ge sounds			Well	
apubic cystostomy h destruction of ve; Rongeur	At about level verumontanum crescentic band across roof of urethra		Well	

TAB[illegible]

Cases from the urologic and pe[illegible]—John[illegible]

CASE NUMBER	DATE	AGE	SYMPTOMS	CLINICAL EXAMINATION	DIAGNOSIS	TREAT
10	11–11–12	17 yrs.	Urinary difficulty since birth	Residual urine; pyuria; urethroscope shows 2 thin valves springing from crista urethralis	Urethroscopy; [illegible] genital valve[illegible] posterior ure[illegible]	[illegible]ture of [illegible]ethram[illegible]ope
11	3–17–16	26 yrs.	Dysuria and urinary frequency for 9 years	Residual urine; pyuria; urethroscope shows 1 valve below verumontanum springing from crista urethralis	Urethroscopy; [illegible] genital valve[illegible] posterior ure[illegible]	[illegible]ision of [illegible]punch"
12	6– 2–17	42 yrs.	Urinary difficulty since early childhood. Frequency; nocturnal enuresis	Residual urine; pyuria; urethroscope shows 2 valves springing from verumontanum running toward external sphincter; reduced renal function	Urethroscopy; [illegible] genital valve[illegible] terior urethra	[illegible]ision [illegible]ith "pu

Résumé: Of the 12 cases comprising this series, 8 were operated. 6 being cured [illegible]edly in admission to the hospital.

—*Johns Hopkins Hospital*

TREATMENT	OPERATIVE FINDINGS	AUTOPSY FINDINGS	RESULT	REMARKS
...ture of valves per ...ethram; urethro-...ope		Remains of valves (Type 2) previously destroyed. Enlarged utricle; bilateral hydroureter and hydronephrosis.	Well	Patient died of pneumonia 1 year later; see autopsy findings
...ision of valve with ...unch"	Single valve on right side of urethra below verumontanum.		Well	Excision followed by partial incontinence
...ision of 1 valve ...th "punch"	Bilateral valves of urethra below verumontanum.		Well	Marked improvement

...dly improved. Four cases were not operated upon, all but one dying shortly after

mid-line, stretching between the verumontanum and the bulbo-membranous junction. These folds were apparently quite thin and at their point of origin from the anterior aspect of the verumontanum closely approached each other, taking, however, a more or less divergent course as they passed on to their insertion in the region of the bulb. It was possible to demonstrate further the more or less curtain-like character of these structures by watching their excursion when the irrigation fluid was passing through the urethra. While they caused no obstruction to the introduction of fluid their divergent course between the verumontanum and the bulb would offer considerable difficulty to the passage of urine.

The renal function at the time of admission was greatly reduced, there being but a trace of the phenolsulphonphthalein excreted in two hours. The blood urea ranged between 0.75 and 0.80 gram to the liter.

Upon ureteral catheterization no ureteral obstruction was encountered. The urine from the right kidney was fairly clear but microscopically showed pus and a staphylococcus infection. Semi-fluid pus was recovered through the left catheter, the condition on this side being one of pyonephrosis. Pyelography on the right revealed a hydronephrosis and some ureteral dilatation.

Operation. This was carried out per urethram by means of the punch instrument. The bladder was first irrigated, filled with water, after which the punch was introduced, withdrawn, turned slightly to the right catching the valve in the fenestra; this was then removed by the circular knife. The same procedure was carried out on the left side. There was practically no bleeding and a small retention catheter was introduced.

Post-operative course. At the time of discharge on August 18, 1917, there was still between 200 and 300 cc. of residual urine. The patient, however, voided with ease and passed his urine at five hourly intervals. He was advised to catheterize himself twice daily. When last heard from, in May, 1919, the patient was practically free of urinary symptoms, holding his urine all night and voiding as much as a pint at a time in a large, forceful stream.

CASES FROM THE LITERATURE

The literature of the condition has been reviewed because it seemed desirable to have at hand every possible case from which to draw our inferences. The 24 cases of which we give below

the salient factors do not, of course, exhaust the mention of the condition in the literature, but they do cover fairly completely the definite reports of cases. They are presented here in an order which depends upon the age of the patient at the time of death or operation.

1. Case of Fuchs (*1*). Report of autopsy on fetus between fifth and sixth month. Running anteriorly from the verumontanum was a ridge which split after several millimeters into two folds which diverged to the two sides of the urethra where they became attached. These folds formed a pocket with its concavity toward the bladder. The prostatic urethra was much dilated, particularly on the posterior wall, the verumontanum lying in the depression. Following the sinus prostaticus and the ejaculatory ducts with a probe, one was led into a cavity about the size of a pigeon's egg, lying behind the bladder. It was evidently formed by a fusion of the seminal vesicles with the sinus prostaticus. The vasa deferentia lost themselves in the walls of this cavity. The bladder was hypertrophied and dilated, the ureters were dilated, tortuous, the left being longer than the right. There was an hydronephrosis present.

2. Case of Fuchs (1). Report on autopsy on full term still-born baby. The verumontanum extended downward along the floor of the urethra in a ridge which divided into two processes. These joined the lateral walls of the urethra, forming valves, which had their concave surfaces toward the bladder. There was a narrow slit between the two cusps. From the upper end of the verumontanum a number of fine folds radiated toward the bladder. Dilatation and hypertrophy of bladder, hydroureters, hydronephrosis.

3. Case of Commandateur (2). Following a normal delivery, the baby breathed ineffectually a few times and died. The body was that of a boy weighing 3100 grams. There were no external malformations. The bladder reached to the liver margin. Urine—specific gravity 1:031. Albumin—heavy precipitate. Ureters much dilated. Kidneys cystic, dilated. Bladder dilated, hypertrophied, trabeculated. Urethra: a sound passed from below met with an obstruction. At the lower end of the verumontanum there was found a delicate valve-like structure which was attached to the floor of the urethra. When not under tension it fell to the lower wall of the urethra almost unnoticed; when ballooned out, however, it practically occluded the urethral canal.

4. Case of Schlagenhaufer (3). A boy died twenty minutes after birth with increasing cyanosis.

Autopsy. Hydronephrosis, hydroureters, hypertrophy and dilatation of the bladder. The prostatic urethra was in free communication with the bladder and the internal sphincter dilated, its wall was thickened and bulged outward. "At the point where the verumontanum usually tapers off into the two low ridges which run forward, outlining a shallow depression between them, one sees the unusually fine opening of the urethra. This opening occurs at the summit of a cone formed by folds which run down to join the mucosa of the urethra in deep pockets.

"At first, attempted catheterization from the bladder forward, even with a fine probe, was unsuccessful, ... from below, however, a relatively large sound passed readily into the prostatic urethra."

5. Case of Bednar (4). A premature boy was seen soon after birth. Infant weak, muscles lax, voice loud, cry that of pain. The umbilicus protruded and was pus covered. At first the child nursed haltingly. On the tenth day he was too weak to nurse and the abdomen was very distended. He died on the twelfth day with evidences of beginning pneumonia. He had not voided for five days.

Autopsy. Pus was found in the umbilical artery and hepatization of the lower lobes of the lungs with pleuritic effusion. The verumontanum divided at its forward end into two folds of mucous membrane which were half-moon shaped and concave towards the bladder. These folds freely admitted the passage of probe from below but on pressure from above ballooned out so as to close the lumen. The external genitalia were normal. The bladder wall was three times normal in thickness. The ureters were widened, and there was a double hydronephrosis with atrophy of the kidney substance.

6. Case of Jordan (5). At four weeks of age a male infant was noticed to dribble urine continuously; at seven weeks he died. Autopsy showed a fibrous stricture of the posterior urethra, a small bladder, hydroureters, the right being larger than the left, cystic kidneys and chronic diffuse nephritis.

7. Case of Fletcher (6). Male infant of three months admitted to the hospital for abdominal distention. At six weeks he had had convulsions and during the four weeks previous to admission had developed a gradually increasing abdominal distention. Examination showed a poorly nourished, anemic baby, with abdomen distended and tympanitic, its skin surface smooth and shiny. To the left a large tumor was felt, practically filling the left upper quadrant. In the upper right quadrant a small mass could be felt below the liver mar-

gin. Above the symphysis a third large round mass reached nearly to the umbilicus. Frequent loose stools. Urination apparently normal. W. B. C. 25,000. Impression: Sarcoma of the bladder.

Operation. An abdominal incision was made but patient's condition was so bad that the abdomen was closed without anything being done. The patient died the following day.

Autopsy. The left kidney, with dilated pelvis formed a tumor twice the size of a new born baby's head. The renal parenchyma was apparently normal. The right kidney was similarly involved but to a lesser degree. The ureters were dilated and tortuous, and the bladder dilated and hypertrophied. "Stretching across the posterior portion of the urethra was a thin membranous septum, formed apparently by a projection of the mucous membrane of the posterior part of the circumference of the urethra." This formed an incomplete diaphragm with its free edge toward the bladder. There was a loose tag of tissue attached to the free edge of the valve which further occluded the opening.

8. Case of Lowsley (7). A boy, three and one-half months old, was brought to the Bellevue Hospital desperately ill. His temperature was 105°. He died a few hours later with edema of the lungs. The only history obtained was that the baby had been ill for a few days only, during which time the mother had noticed nothing unusual about his urination.

Autopsy. The verumontanum measured 3 mm. in height and was 3 mm. wide at its broadest point. Stretching from it were 6 small bands which extended backward to the internal sphincter. Extending downward from the verumontanum on the floor of the urethra was a thick band of tissue which continued downward to the membranous urethra "where it divided into two portions and then attached itself intimately to the entire urethral circumference, with the exception of a small slit-like opening on the floor of the urethra just to the left of the median line." This caused almost complete obstruction to the urinary outflow. The bladder was much hypertrophied. The prostatic urethra was dilated to such an extent that it was continuous with the bladder. The ureters were dilated and tortuous. The left kidney was larger than the right, both were dilated and cystic. The right cord was involved in a very large hydrocele; otherwise the external genitalia were normal.

9. Case of Lindeman (8). A boy of four months was admitted to the hospital. There was a marked edema, particularly of the eyelids and

lower extremities. There was no fever and no convulsions. The patient died soon after admission, without a diagnosis having been made. He did not void after entering the hospital.

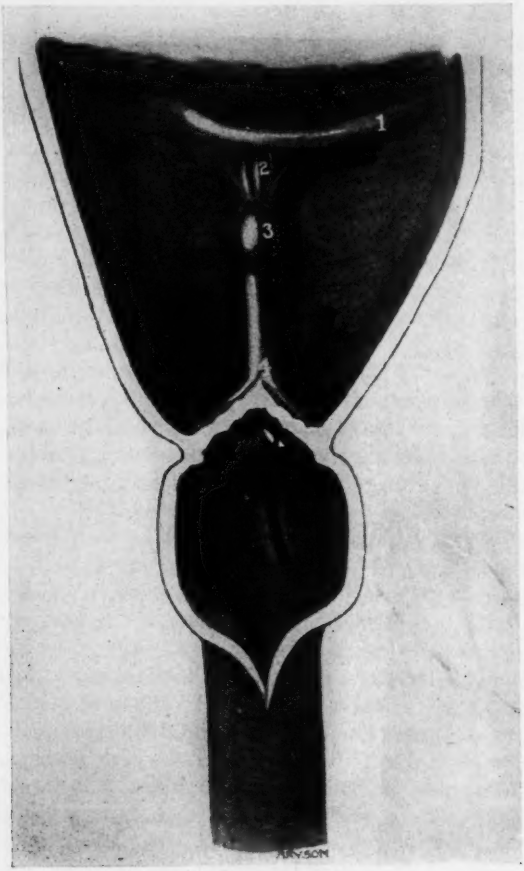

FIG. 10. DIAGRAM FROM LOWSLEY'S ARTICLE

(See Ann. Surg., lx, 1914.) *1*, Dilated internal sphincter; *2*, folds running from internal sphincter to verumontanum; *3*, verumontanum; *4*, bifurcation of crista urethralis. Probe passes through slit-like opening in obstruction. See case 8.

Autopsy. The left kidney was hydronephrotic and showed but little kidney tissue remaining; the right kidney showed a somewhat greater destruction. Both ureters were greatly dilated. "In the preparation which was made by cutting the urethra along its upper wall, the isthmus urethrae seems to be made up of two pockets similar to the fingers of a glove, divergent to the pars bulbosa; each of these pockets is 1 cm. in diameter; and between them the pars pendula insinuates itself. The pars pendula averages 6 mm. in diameter here as it does further down in its course. The bulging out of the isthmus mentioned above ends in blind pockets. The connection between them and the pars pendula is through a very narrow slit which measures barely 3 mm. and is found at the point of divergence of the folds."

10. Case of Morton (9). A boy of thirteen months had been ill for three months with wasting, vomiting and distended abdomen. Examination showed a hypogastric mass, evidently the bladder, which disappeared on catheterization. The urine obtained in this way showed blood and pus. The temperature ranged from 101° to 102° F. Death.

Autopsy. Hydronephrosis, hydroureters, hypertrophied bladder. "A small valve fold was found in the roof of the urethra just beyond the vesical orifice, directed downward and backward so that although the passage of the urine would be much interfered with, a catheter would not be obstructed."

11. Case of Thompson (10). A boy of fourteen months. For three months he had been constipated. Urination had evidently been painful, there was much straining and the act was accompanied by anal prolapse. Pus had recently been noted in the urine. Upon examination a mass was found in the lower abdomen which did not disappear on catheterization. An abdominal incision was made, the mass was found to be the bladder, which was opened and a drainage tube inserted. The patient died.

Autopsy. Hydronephrosis, hydroureters, hypertrophy and dilatation of the bladder. At the junction of the vesical orifice with the prostatic urethra was found a "diaphanous membranous septum lying flush with the wall of the open urethra." "A small opening must have existed in this, but that it was small was shown by the fact that the membrane appeared nearly complete."

12. Case of Wilckens (11). A boy of two and one-half years who had been previously well, developed diphtheria and after an illness of ten days was tracheotomised. The following day he had a number of convulsions and died.

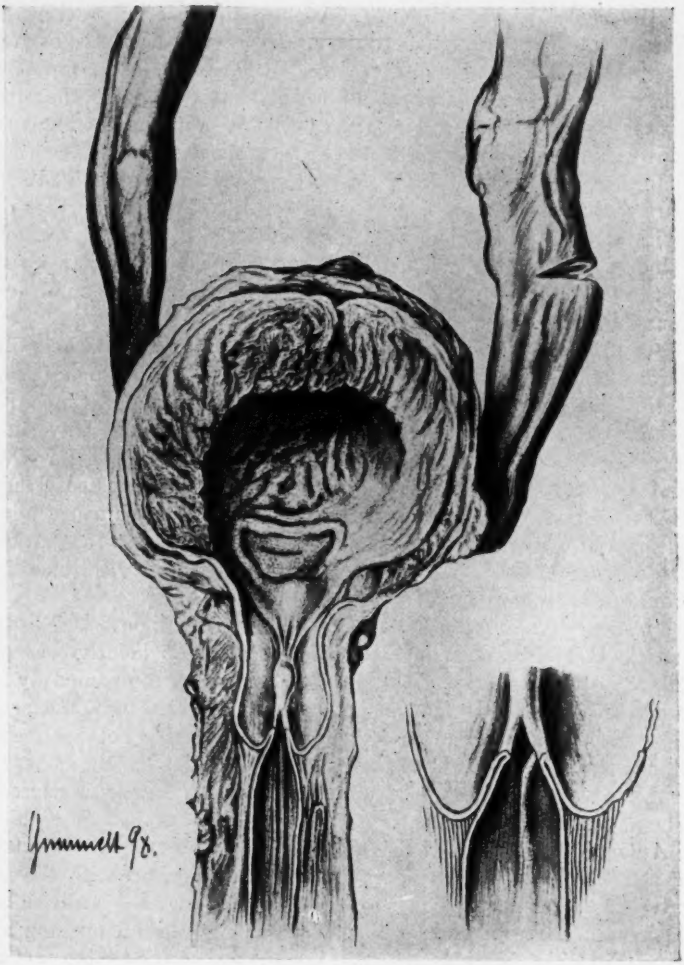

FIG. 11. ILLUSTRATION SHOWING VALVES OF TYPE 1

Showing dilatation of posterior urethra, hypertrophied bladder and hydroureters. Insert gives detail of valve formation. Lindeman, F. P., Inaug. Dis., Jena, 1904. See case 9.

Autopsy. Genito-urinary findings: The pendulous urethra was normal. "At the point of transition from the pars membranacea into the pars prostatic urethrae, but lying for the most part in the pars membranacea, there are two folds on the two sides of the urethra which course '*von hinten oben nach vorne unten.*' " (Because of an evident error in the German text, this clause is left untranslated.) These folds of mucous membrane are drawn out into the valves in the lumen of the urethra. In this way pockets are formed on the two sides, whose concavity is turned toward the bladder. On the anterior wall of the urethra these folds almost but not quite touch. On the posterior wall they fuse . . . . and join the ridge which is formed by the prolongation of the colliculus seminalis downward along the midline."

13. Case of Lindeman (8). A four year old boy was brought to the hospital with the history of having been acutely ill for eight days. There were no further details. Examination showed nasal, tonsillar and pharyngeal diphtheria, with extension into the larynx, consequent dyspnea and retraction of the soft parts on inspiration. There were petechial hemorrhages. The patient was tracheotomised, dying twelve hours later.

Autopsy. There were the usual findings of a severe upper respiratory diphtheria. The bladder was hypertrophied and the pars prostatica and isthmus urethrae much dilated. The verumontanum was unusually prominent and stretching downward from it in a fanlike arrangement were five large folds and further to one side one small fold. The median fold was the largest, measuring 1 cm. These folds shut off communication between the isthmus and the anterior urethra except for a narrow slit 3 mm. in length, situated at the point of divergence of the folds. The external genitalia were normal. The kidneys were hydronephrotic, the left kidney atrophic. Both ureters were widely dilated.

14. Case of Heinecke (12). A boy of five years had difficulty in urination since birth. Urination took from twenty to twenty-five minutes. In the intervals between urination he dribbled constantly, always being wet. He had frequently been catheterized for retention and it was noted that the catheter met with an obstruction just before entering the bladder. For three months previous to admission he had an evening elevation of temperature frequently as high as 40°C.

Examination showed a normally developed, pale boy. The bladder was large and readily palpable and there was constant dribbling of urine. Two or three times daily the patient urinated a very thin

FIG. 12. ILLUSTRATION SHOWING FOLDS ORIGINATING AT VERUMONTANUM, OBSTRUCTING POSTERIOR URETHRA

From article by Heinecke, E. Zeitschr. f. Urol., vii. See case 14.

stream, the act taking about one-half hour. Upon catheterization a large amount of urine was obtained, showing pus and albumin but no casts. Ten days after admission the patient became worse, catheterization was difficult and a suprapubic cystostomy was carried out. The patient died a few hours later.

Autopsy. The primary lesion was found in the posterior urethra. "Upon opening the urethra, the lumen appeared nowhere to be widened or narrowed. From the verumontanum two half-moon shaped folds stretched downward in gentle curves, to be attached to the two sides of the urethra. In this way the pars prostatica is shut off from the pars membranacea as by two barriers." The bladder wall was thickened in both musculosa and mucosa. There were hemorrhages in the mucous membrane. The external genitalia were normal. The ureters were widened, the left being larger than the right. The kidneys were hydronephrotic, many abscesses being found in the kidney substance, particularly on the left side. Microscopic examination showed the valves to be composed of mucous membrane over loose connective tissue in which were a few smooth muscle fibers.

15. Case of Knox and Sprunt (13). A boy, aged five years, had always had to wear napkins which he wet about every half hour. The urine was often thick and milk-like. Otherwise his history was uneventful till three years of age when he had measles, following which he had a chronic otitis media. When seen he complained of loss of weight, loss of strength and diarrhea. Examination showed a pale, emaciated boy, with evidence of rickets. The abdomen was distended. In the left lumbar region a soft movable lobulated mass could be felt, extending upward to the costal margin. A similar mass could be made out on the right side, below the edge of the liver. A third rounded mass extended in the mid-line from the pubis to the umbilicus. The external genitalia were normal except for the fact that the external meatus was too small to admit the smallest catheter available. The urine was acid, the specific gravity 1.002 to 1.004, containing a faint trace of albumin, no sugar but many pus cells and red blood cells. He was lost sight of for six months and then admitted to the Medical Service of the Johns Hopkins Hospital. Two months before, he had developed a cough and abdominal pain, since which time he had become progressively worse. He was pale and extremely ill. The breath sounds were harsh and there were a few râles. The abdomen was distended and a number of soft coils, thought to be intestines, were made out. Above the symphysis and reaching nearly to the

FIG. 13. SHOWING SPECIMEN OF CASE REPORTED BY KNOX AND SPRUNT
See Amer. Jour. Dis. Child., lv, 1912. See case 15

umbilicus was an oval mass thought to be the bladder. The urine contained pus and a trace of albumin. X-ray after a bismuth meal showed the stomach to be slightly dilated but the motility was normal. There was unusual stasis between the sigmoid and the rectum. The child's condition became progressively worse and after repeated convulsions he died.

Autopsy. "Through the wide internal meatus the bladder becomes continuous with the greatly dilated and thick walled prostatic urethra which forms an oval sac with the distal, blind extremity 2.5 cm. from the internal meatus. The floor of this pouch shows several prominent folds near the mid-line, which end below in an unusually prominent verumontanum which reaches three-fifths of the distance from the internal meatus to the blind end of the sac. The opening of the vagina masculina is conspicuous, shaped like a crescent, with the concavity directed upward. Numerous orifices of the prostatic ducts are observed on each side of the verumontanum, but those of the ejaculatory ducts are not seen. Immediately below the verumontanum the ridge of which it forms a part, divides into two prominent diverging folds which soon fuse with the anterior wall of the urethra instead of fading out gradually on the posterior wall of the membranous urethra as usual. Just below the verumontanum between the diverging folds, there is a small equilateral triangular opening whose sides measure about 3 mm. A probe passed through from the anterior urethra presents in this opening and abuts against the hypertrophied verumontanum. This is the only communication between the anterior and posterior portions of the urethra." The bladder was dilated, hypertrophied and trabeculated. There were scattered ecchymoses in the mucosa. The ureters were tortuous, enlarged, thickened. The kidneys were hydronephrotic, the left being larger than the right.

16. Case of Lindeman (8). A strongly built, five and one-half year old boy, was admitted to the hospital. The physical examination was negative except that resistance could be made out in the bladder region. He voided only in a thin stream. He had no pain, no convulsions, but went from bad to worse and died without a diagnosis having been made.

Autopsy. Double hydronephrosis with atrophy of the kidney substance. The ureters were dilated widely, thick walled and tortuous. The bladder was hypertrophied. The pars prostatica and isthmus were wide. From the posterior limit of the verumontanum ran three folds diverging toward the bladder. From the anterior end ran two

other folds which formed valves shutting off the urethra except for a narrow slit.

17. Case of Lederer (14). A boy previously considered well, had scarlet fever at six or seven years. There was no record of any renal complication. However, following the attack he suffered from difficulty of urination, long straining being necessary to start the stream, upon which he would pass large amounts of reddish urine, with white or yellow shreds. He suffered from incontinence both day and night. He was always sickly and pale. There was no swelling of the feet. After going on in this manner for several years he became suddenly ill with dyspnea and swelling of the face and was admitted to the hospital. Examination: Eleven year old boy, well developed, fairly well nourished, pale, edematous. Cheeks, lips and nose were cyanotic. The throat was pale and slightly edematous. Respiration was deep and there were many râles. The heart action was rapid and weak. He was vomiting. The urine showed albumin; red blood cells but no casts. The diagnosis made was uremia following old scarlet nephritis. He died forty-eight hours after admission.

Autopsy. Both kidneys were large and hydronephrotic, particularly the left, which was filled with blood stained fluid and clots. The right was filled with pale, slightly turbid fluid. Both kidneys were divided by septa into many small compartments. Here and there on the walls of the compartments were bits of the kidney tissue. The ureters were both dilated to many times their normal size. The bladder was pear shaped and trabeculated. Upon trying to pass a sound from the bladder, resistance was encountered in the first part of the membranous urethra. This resistance was also met with in passing a sound upward from the meatus. One centimeter below the verumontanum there was a semicircular diaphragm with its concavity upward. This entirely closed off the urethra except for an opening about the size of a hemp seed in the posterior part. This opening lay at the end of a fibrous band stretching down from the verumontanum. There was great dilatation of the prostatic urethra which resembled the bladder closely in its mucosa. The internal sphincter could be located by the muscle fibers which shone through the mucosa. The external genitalia were normal except for phimosis.

18. Case of Posner (15). Boy, aged eleven years had been well until he had an attack of scarlet fever. Soon after this he developed pyelitis, with pain in the right kidney region, pus in the urine and hematuria. Examination showed a large bladder. This was catheter-

ized and 1100 cc. of purulent urine obtained. The author felt that that might be but a chance finding, so, on frequent occasions he repeated the catheterization. On each repetition he found residual urine which decreased from the original large amount until it was reduced to 10 cc. The catheter always overcame a resistance encountered in the bulbar region, and he felt that there was a stricture there, which he believed to be congenital in origin.

19. Case of Budd (16). A sailor, aged sixteen years, was admitted unconscious, dying in two days.

Autopsy. The renal pelves were dilated, the kidneys being but thin walled sacs. The ureters were as large as intestines. The bladder was hypertrophied and dilated. In the upper wall of the membranous urethra was a fold of membrane similar to the valve in a vein.

20. Case of Bazy (17). A young soldier came in complaining of incontinence over a period of many months, preceded by difficult urination dating back to early infancy. He had crises of retention. Instrumentation always met with an obstruction in the posterior urethra. Perineal operation: The membrane occupied the entire periphery of the canal, decreasing the caliber greatly. It was made of two folds between which there was a narrow slit. It lay in the bulbous urethra. The folds were resected. Cure.

In the same article the author reviews six cases which he had formerly reported (18) in which, while there was no operation or autopsy, he felt sure there were valve-like processes. Four had come to him for incontinence, one for bacilluria and one for dysuria. In each case he felt on passing a sound a peculiar resistance about 1 cm. beyond the external sphincter. More recently Artus (19) has reported from Bazy's Clinic two further cases, in boys five and seven years old, respectively, which were admitted for incontinence. These cases were cured by instrumentation and the author presented them as examples of congenital stricture. It should be noted that in none of these case reports is any mention made of the presence of residual urine, dilated bladder or other evidence of urinary back pressure. The diagnosis was made apparently on the mere passage of a sound which encountered resistance in the region of the external sphincter. While these cases may be examples of congenital obstruction, the evidence at hand is not conclusive, and the exact site of the obstruction is not certain.

21. Case of Picard (20). A brewer, forty years of age, of an athletic build, came to the hospital, complaining of cough and difficult urination. He was fully conscious. While undressing he fell unconscious,

frothing at the mouth, his extremities moving convulsively. He was bled and after half an hour recovered somewhat. On examination there was slight edema of the lower extremities. The bladder was palpable. There was no evidence of paralysis. A diagnosis of uremia

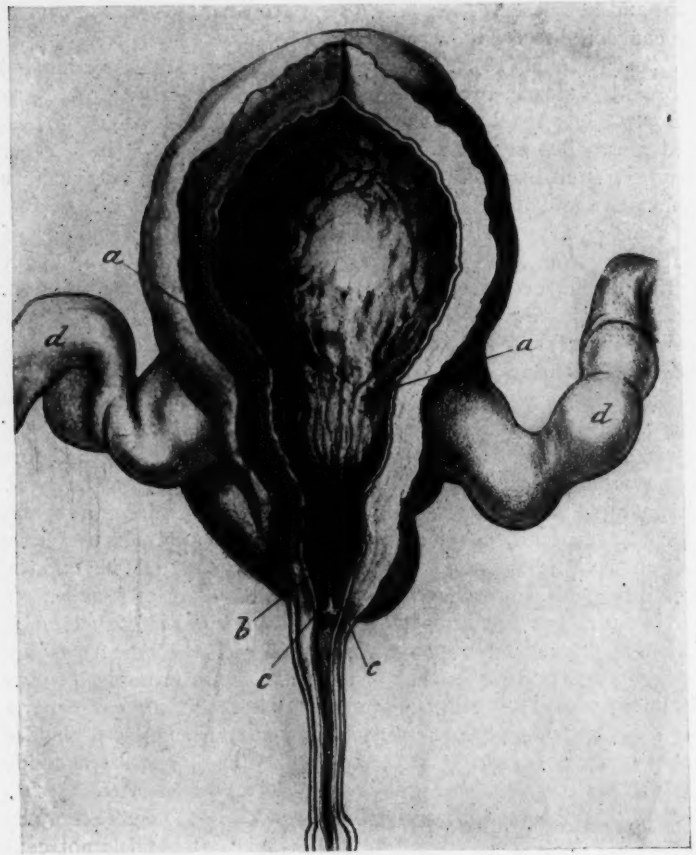

FIG. 14. ILLUSTRATION SHOWING RESULT OF FAIRLY COMPLETE OBSTRUCTION ON POSTERIOR URETHRA, BLADDER AND URETERS

The valves are of type 1. From article by Tolmatschew in Archiv. f. Path. Anat., 1870, 11. See case 24.

was made and the patient was catheterized. The catheter met with resistance and a smaller one was introduced. The patient became suddenly much worse and died in four minutes. He was catheterized post mortem, the urine being milky, acid and containing albumin.

Autopsy. Revealed congestion of the brain and some peritoneal fluid. Anterior to the verumontanum and 3 mm. to the side of the mid-line was a fold of resistant connective tissue. It was attached to the floor of the urethra in a diagonal direction, with its free edge upward. A small catheter introduced from below passed this valve, but on forcing fluid from above it was ballooned out. The bladder wall was thickened, the ureters dilated, and the kidneys damaged from pressure of the urine in the pelves. It later developed that four years previously the patient had had an attack of urinary retention and incontinence which had been relieved by catheterization.

22. Case of Iverson (21). A man, eighty-five years old, had difficulty in urinating and frequently passed blood. The bladder could be felt reaching the umbilicus. Repeated catheterization failed to recover any urine and it was felt that there might be a false passage. A large prostate was palpable rectally. The patient was very uremic and soon died.

Autopsy. Showed marked dilatation of the prostatic urethra. The crista urethralis divided into two thin valves which formed a cup-like obstruction in the urethra.

The following cases fall out of series, as the age is not given:

23. Case of Godart (22). *Autopsy.* "In the urethral canal on one side of the verumontanum, one sees a membranous valve, very fine and delicate. The free edge is inclined toward the bladder."

24. Case of Tolmatschew (23). No history or physical examination. "The principal interest in the urinary apparatus lay in the presence of the valves in the urethra. These originated from a ridge, 8 mm. long, 1 mm. broad and 0.5 mm. in height, which starting at the anterior end of the verumontanum ran downward along the floor of the urethra. This ridge separated into two thin membranes, which attached themselves one to the right, one to the left half of the urethra. Each of these membranes was attached by its anterior margin, in a semicircular fashion, to the wall, while the free margin was directed backward, thus forming a pocket, concave toward the bladder. In the mid-line, both anteriorly and posteriorly, these pockets were in apposition." The lower part of the urethra was normal. That part of the urethra lying above the valves was enlarged and the internal

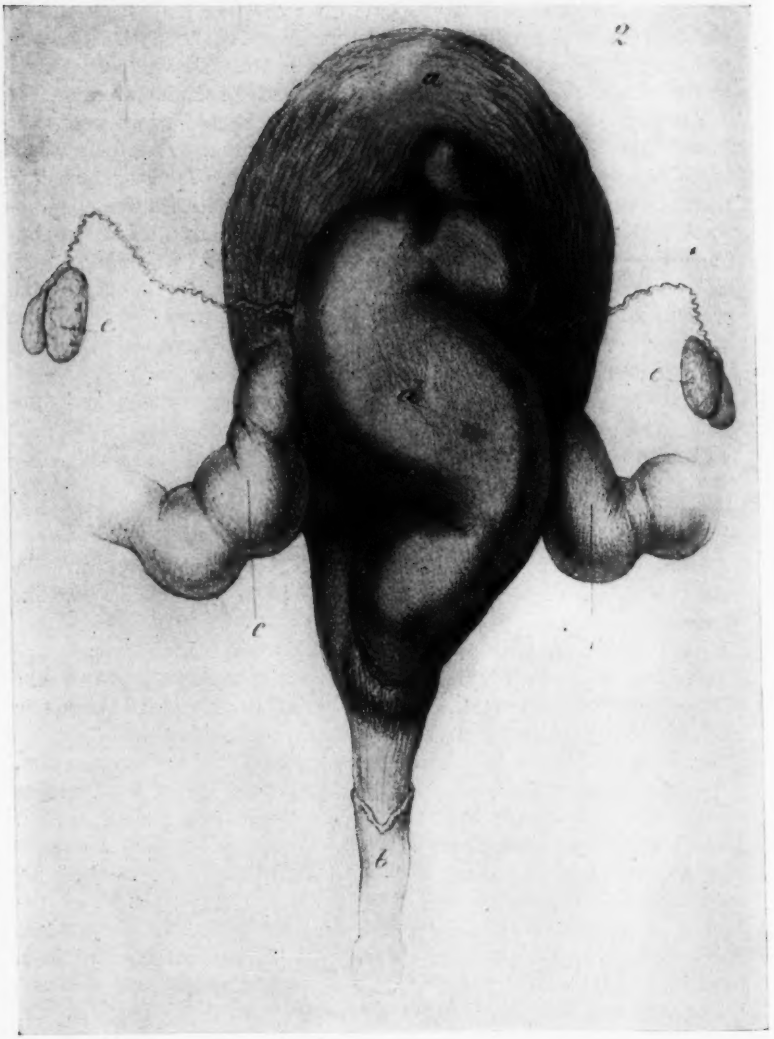

FIG. 15. POSTERIOR VIEW OF TOLMATSCHEW'S CASE

Showing enormous size of utriculus prostaticus. Archiv f. Path. Anat., 1870, 11. See case 24.

sphincter was obliterated. The verumontanum was pushed downward into a depression in the floor of the urethra and was brought up for examination only with difficulty. Its size and form were normal. In the center of it was found the opening of the utriculus prostaticus which on probing, was found to lead into a cavity lying behind the bladder. The bladder was enlarged, increased in length and pear shaped. The walls were hypertrophied. Behind the bladder and connected with it through the opening of the verumontanum lay a thin walled multilocular sac, which was filled with urine. It was lined with pavement epithelium which, in the lower part, resembled that of the vagina.

In addition to these cases it is interesting to note from an historical standpoint that Velpeau (24, 25), in 1832 described folds in the posterior urethra which resembled valves, and mentions the possibility of their causing obstruction to the passage of a catheter. Jarjavay (26) in his interesting monograph on the urethra published in 1856 mentions folds at the bifurcation of the crista urethrae, and states that he has also seen in the anterior portion of the pars prostatica, a circular membrane with its periphery attached to the urethral wall, having in its center an opening 3 mm. in diameter. This membrane he likened to the iris. Both he and Velpeau mention an article by Langenbeck (27) written in 1802 in which a mention is made of congenital valvular obstruction of the posterior urethra. So far as we can determine this is the first reference to the condition in the literature.

TABL... the l...
Cases coll...

NUMBER	AUTHOR	DATE	AGE	SYMPTOMS	CLINICAL EXAMINATION
1	Fuchs	1900	5 mos. fetus		
2	Fuchs	1900	Full term fetus		
3	Commandateur	1898	Died at birth		
4	Schlagenhaufer	1896	Died at birth		
5	Bednar	1847	12 days	Weak; abdominal distension	Distended abdomen
6	Jordan	1913	4 wks.	Urinary incontinence	
7	Fletcher	1908	3 mos.	Convulsions; abdominal distension; urination normal	Distended bladd... large tumor left u... per quadrant; sma... tumor right upp... quadrant
8	Lowsley	1914	3½ mos.	Only ill "few days," urination normal	Edema of lungs; t... perature 105°
9	Lindeman	1904	4 mos.		Edema eyelids a... lower extremiti... "Did not void aft... entering hospital"

the literature

DIAGNOSIS	TREATMENT	OPERATIVE FINDINGS	AUTOPSY FINDINGS	RESULT	REMARKS
			Division crista urethrae below verumontanum forming two valves	Dead	
			Division crista urethrae below verumontanum forming two valves	Dead	
			Delicate valves attached to floor of urethra at lower end of verumontanum	Dead	
			Funnel shaped valve attached to lower aspect of verumontanum	Dead	
			Verumontanum at lower end divided into two crescentic folds	Dead	
			"Fibrous stricture," posterior urethra	Dead	
areoma of the bladder	Operation (abdominal) attempted but stopped account of patient's condition		Membranous septum posterior urethra	Dead	
			Division crista urethrae below verumontanum forming two valves	Dead	
			Two folds below verumontanum	Dead	

TABLE ... *Cases col...*

NUMBER	AUTHOR	DATE	AGE	SYMPTOMS	CLINICAL EXAMINATION	DIAGN...
10	Morton	1903 1904	13 mos.	Wasting; vomiting; distended abdomen	Distended bladder; catheterization; py... uria	
11	Thompson	1907	14 mos.	Urination painful and difficult	Distended bladder; catheterization; py... uria	
12	Wilckens	1910	2½ yrs.	Diphtheria; previously well		
13	Lindeman	1904	4 yrs.	Acutely ill for 8 days	Diphtheria	
14	Heinecke	1913	5 yrs.	Difficult urination since birth; incontinence; frequency; frequent urinary retention	Distended bladder; py... uria; catheter m... obstruction in de... urethra	Destruc... to ... tion i... ureth...
15	Knox-Sprunt	1912	5 yrs.	Urinary frequency since birth; lost weight and strength	Distended bladder; palpable masses i... region of kidney	
16	Lindeman	1904	5½ yrs.	Difficult urination	Resistance in bladder	
17	Lederer	1911	11 yrs.	Well for 6 years. Following scarlet fever, dysuria, incontinence, edema	Albuminuria	Uremi...
18	Posner	1907	11 yrs.	Following scarlet fever, pain in right kidney, pyuria, hematuria	Dilated bladder; cath... eter obstruction i... bulbous urethra... Residual urine 1100 cc.	Impac... stric... bull... uret...
19	Budd	1840	16 yrs.	Unconsciousness		

TABLE ...ased
...ases col... in the literature

...MINATION	DIAGNOSIS	TREATMENT	OPERATIVE FINDINGS	AUTOPSY FINDINGS	RESULT	REMARKS
bladder ...tion; py...				Valve just below internal sphincter in roof of urethra	Dead	
bladder ...tion; py...		Suprapubic cystostomy	Distended bladder	Membranous septum just below internal sphincter	Dead	
				Division crista urethrae below verumontanum forming 2 valves	Dead	
				Six folds below verumontanum	Dead	
...adder; py... ...eter m... ...n in dee...	...struction ...to urination in deep urethra	Suprapubic cystostomy; catheterization		Verumontanum at lower end divided into 2 crescentic folds	Dead	
bladder ...masses i... ...kidney				Division crista urethrae below verumontanum forming two valves	Dead	
				Two folds from anterior aspect verumontanum forming valves	Dead	
...n bladder	...remia			At end of crista urethrae below verumontanum semi-circular diaphragm	Dead	
...dder; cath... ...ruction ... urethra ...urine 1100	...ngenital ...stricture ...bulbous ...urethra	Frequent catheterization			Cured	Diagnosis: not confirmed. Obstruction bulbous urethra
				Membranous fold in upper wall membranous urethra	Dead	

TABL... *Cases coll...*

NUMBER	AUTHOR	DATE	AGE	SYMPTOMS	CLINICAL EXAMINATION	DIAGN...
20	Picard	1855	40 yrs.	Difficult urination; uremia	Edema lower extremities; enlarged bladder; obstruction posterior urethra	...struc... ...in po... ...ureth...
21	Iverson	1914	25 yrs.	Difficult urination; hematuria	Dilated bladder; catheter could not be introduced into bladder	...lse p...
22	Godart	1854	?	Not given	Not given	...t ma...
23	Tolmatschew	1870	?	Not given	Not given	...t ma...

Résumé: Of the 23 cases reported in the literature, 22 were dead, the anomaly b... ...over... while another case was treated by catheterization without operation. In none of the c... ...any...

TABLE
ases col *the literature*

EXAMINATION	DIAGNOSIS	TREATMENT	OPERATIVE FINDINGS	AUTOPSY FINDINGS	RESULT	REMARKS
er extre arged bl truction urethra ddder; ca d not be into bl	struction n posterior urethra			One valve below verumontanum in floor of prostatic urethra	Dead	
	lse passage			Division of crista urethrae into 2 valves	Dead	
	t made	None		Membranous valve on one side verumontanum	Dead	
	t made	None		Division crista urethrae below verumontanum into 2 valves	Dead	

nomaly b overed post mortem. Two of the fatal cases were operated by suprapubic cystostomy,
e of the c any operation carried out for the cure of the valvular obstruction.

SUMMARY

1. Frequency. A review of the literature has revealed twenty-four authenticated cases of congenital obstruction of the posterior urethra; while in the last six years there have been admitted to The Johns Hopkins Hospital twelve cases showing this condition. It is therefore considerably more frequent than would be inferred from the attention given it in the past.

2. Etiology and pathology. Autopsy studies have shown that there are three distinct types of congenital obstruction, all more or less valvular in construction, so placed that the concave surface of the valve is directed upward, thus bringing about an obstruction to the outflow of urine. In the great majority of cases symptoms of the condition are manifest during infancy or early childhood.

3. Symptoms of the condition are those arising from obstruction to the outflow of urine together with the symptoms resulting from renal destruction, induced by back pressure and infection.

4. Diagnosis. The history of symptoms of urinary obstruction in male children should always suggest the possibility of this condition. The presence of a distended bladder and particularly of residual urine is further indicative of obstruction. This possibility is further strengthened by obstruction in the posterior urethra to the passage of a catheter. Much information regarding the character and exact location of the valves and the renal damage resulting therefrom may be obtained by urethroscopy, the x-ray, and renal function studies.

5. Treatment. The treatment of the condition is surgical and consists of the removal of the obstruction. This may be accomplished in certain cases by the passage of a sound with the forcible rupture of the valve; in certain other cases the obstruc- tion may be removed by the urethrotome or by urethroscopic methods.

Of the operative procedures the selection of the suprapubic or perineal route will be governed by the personal preference of the operator. In infants and young children the suprapubic method has proved very satisfactory, the valvular obstruction being removed by its forcible rupture with a sound, its division with a rongeur, or its removal by scissors or cautery. In adults the condition is treated in most cases by intra-urethral methods.

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PLATES

PLATE 1

A step in the perineal operation for the removal of congenital valves of the posterior urethra. The posterior surface of the prostate has been freed of the levator muscle and the posterior layer of Denonvillier's fascia. Note outline of horse-shoe incision for exposure of the urethra. Insert shows flap of prostate with posterior wall of urethra drawn back exposing the valves.

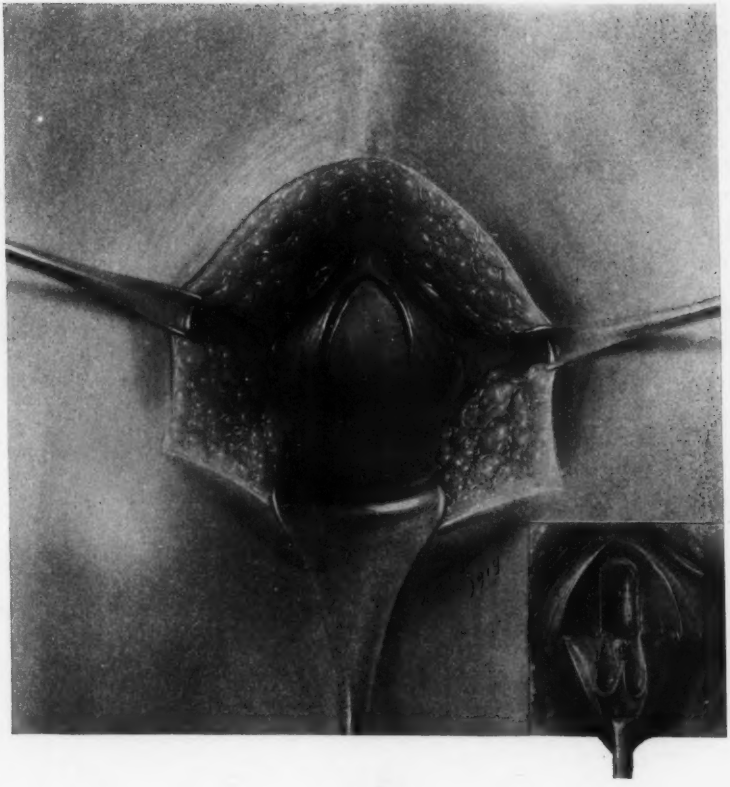


PLATE 2

Final step in the perineal operation for the removal of congenital obstruction of the posterior urethra. The valves having been removed, the edges of the incision are approximated. Insert shows the completed line of suture.

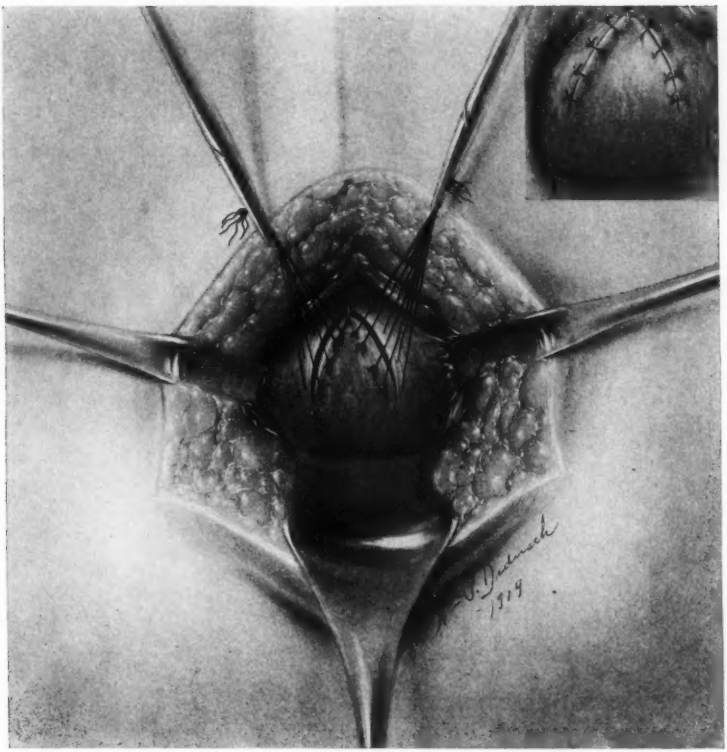


PLATE 3

Plate of specimen from case 1. Both valves arose from the bifurcation of the crista urethralis, a variety we have classified as type 1. Note the dilated posterior urethra, the hypertrophied bladder and the hydroureters.

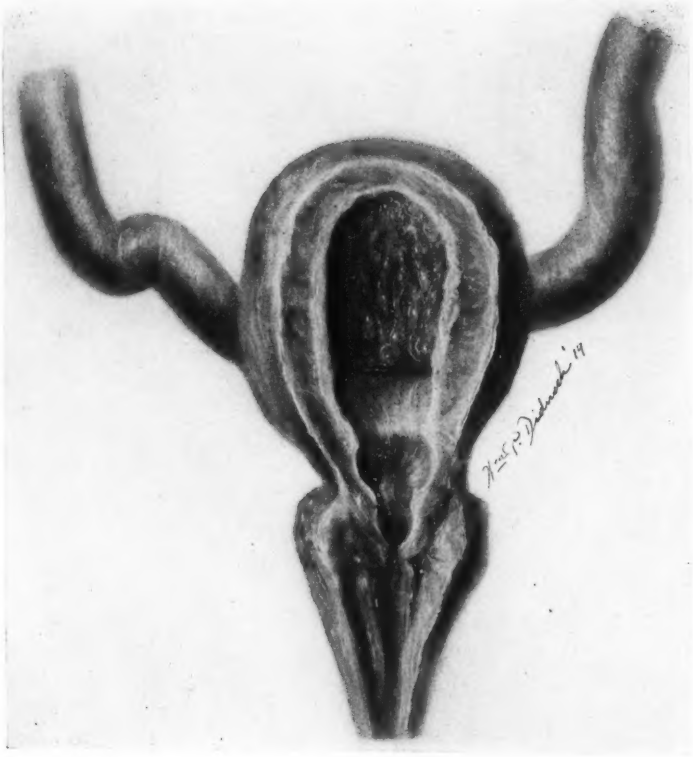


PLATE 4

Plate of specimen from case 4. An example of the crescentic type of valve (type 3), varieties of which may be found at any level of the posterior urethra. Note the dilated posterior urethra, the hypertrophied bladder and the hydroureters.

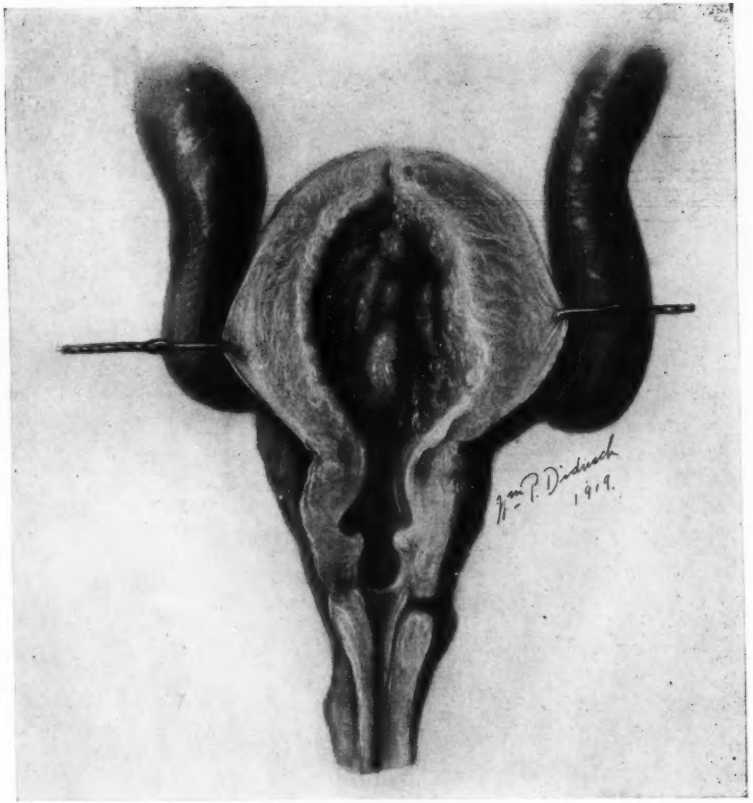
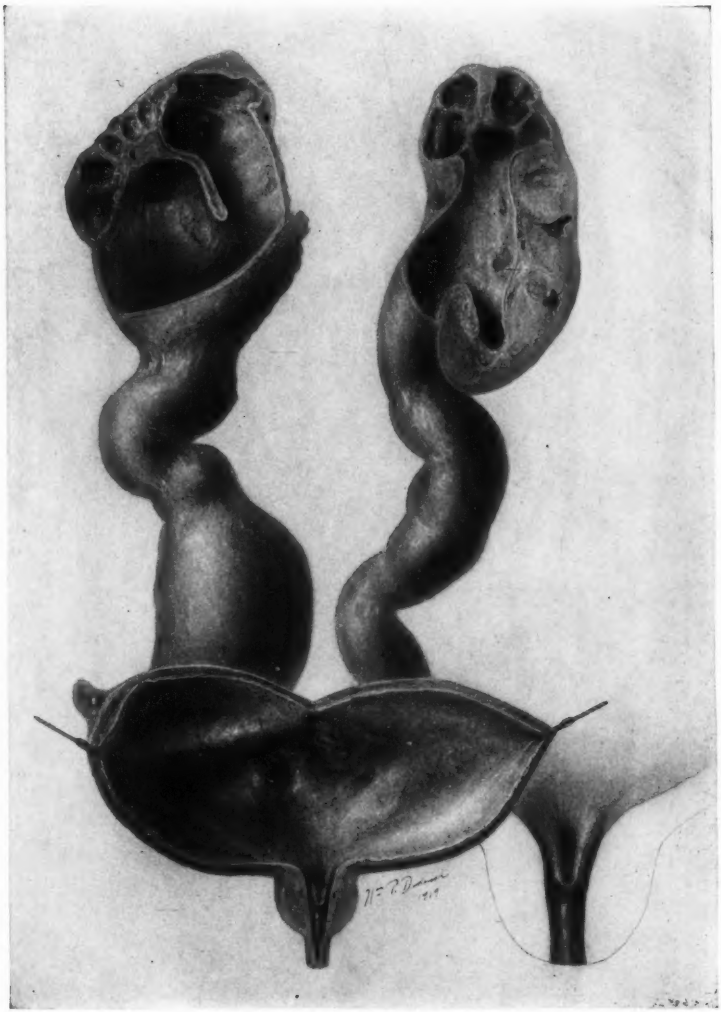


PLATE 5

Plate of specimen from case 10, showing the remains of congenital obstruction (type 2). Note the dilated bladder, the hydroureters and the bilateral hydronephrosis. The patient had been operated upon one year previously and the valves ruptured instrumentally. Insert shows dilatation of the sinus pocularis.



AN EXPERIMENTAL STUDY OF URETERAL LIGATION

DEMONSTRATION OF LATE RESULTS TO URETER AND KIDNEY

JOHN R. CAULK AND R. F. FISCHER

St. Louis, Missouri

A preliminary report on this subject was given before this Association in 1915, the basis of the report being the discussion of a patient on whom both ureters had been ligated during a hysterectomy for fibroids, and who had passed no urine for eight days. It was recognized early that the ureters had been tied, but the surgeon awaited developments, thinking that possibly the cat gut would loosen and the ureter would open spontaneously. At the end of the eighth day she became uremic. At this time I saw her and advised double nephrostomy, which was acceded to and done, with very little disturbance to the patient and with the result that during the next twelve hours over 100 ounces of urine were secreted, the analysis of which showed a specific gravity of 1007, a trace of albumin and the sediment to contain granular and hyaline casts and red blood cells. Drainage through the nephrostomy tubes was free until the fifty-eighth day when the patient voided. Ten days later the urine was passed entirely by the bladder and the wound had healed. At this time the patient's condition was good but the kidney function as determined with phthalein was quite low. Since then I have watched this patient with great interest. She is in excellent health and her renal function has returned to normal limits. This observation clearly demonstrates that kidneys which have been completely obstructed for eight days are capable of promptly resuming their function after drainage. This has been experimentally shown in the recent works of Keith and Pulford, and of Johnson. Furthermore it establishes conclusively that ureters which have been ligated with absorbable material may eventually open and

drain sufficiently to allow closure of the nephrostomy wound with the resulting complete restoration of health to the individual and without evidences of late ureteral obstruction.

Besides this case we have seen a number of instances of this complication of pelvic surgery; one other double, and several single involvements. We believe that this complication occurs more frequently than is supposed. Barney has collected 62 cases of occlusion during pelvic operations. Cf these 46 were unilateral and 16 bilateral. Kelly and Burnham state that ligation is the most frequent complication of the ureter during pelvic surgery. In this paper we will confine ourselves strictly to ligations and wish it to be clearly understood that ureteral severance is not under consideration. The bilateral cases, of course, manifest themselves by anuria, and demand urgent relief, whereas a unilateral ligation, owing to either complete absence or a great paucity of symptoms may not attract the surgeon's attention to the possibility of renal occlusion.

The clinical cases which we have observed stimulated us to undertake an experimental investigation of this important problem. Our preliminary report dealt only with the immediate effects of such ligations and bore chiefly on the subject of double ligation in which urgent measures are indicated in order to save the life of the individual. We wish now to briefly summarize our previous findings and to append our observation on the late results.

Experiments were done entirely on dogs and in all 70 animals were used. The pathological specimens have been demonstrated to the American Urological Association at its meeting in St. Louis and to the Society of Clinical Surgeons. At present we will not give a detailed pctocol of all the experiments, but for the sake of brevity will summarize our findings. The problem before us appeared to be as follows:

In case of double ligation, is it better to deligate the ureter, to do a uretero-vesical anastomosis, or a double nephrostomy in the hope that the ureters will finally open and the kidneys be saved? Inasmuch as the idea seems current that cat gut, the ligature usually employed, will be absorbed sufficiently within a

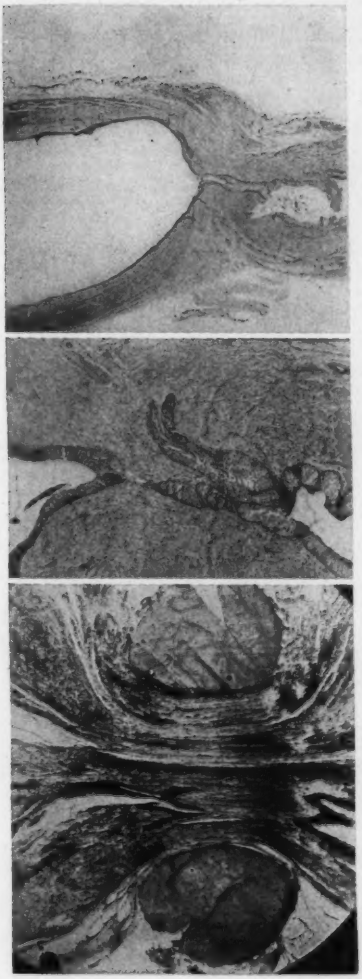


FIG 1. URETER AT SITE OF LIGATION; ONE HOUR

FIG. 2. SITE OF LIGATION; FIVE WEEKS

FIG. 3. SITE OF LIGATION; SIX WEEKS

few days to allow the ureter to open, we first endeavored to determine the time necessary for the absorption of no. 2 plain cat gut (fig. 1); secondly, if the ureter after such ligation would finally open, and the manner in which this opening occurred; thirdly, the length of time required for it to open; and lastly, the renal complications at various intervals following sudden occlusion of the ureter.

Our experiments consistently showed that no. 2 plain cat gut was never absorbed before the end of three weeks. In other words, it would be futile to wait for the cat gut to absorb before attempting to save the kidney.

Granting that the cat gut would not be absorbed before the death of the individual in the case of double, or before almost complete destruction of the kidney in the case of single ligation, one of the three problems just suggested—namely, deligation, uretero-vesical anastomosis, or nephrostomy—must be done. The ideal method, of course, would be immediate deligation, but such an operation would seem to be attended with considerable difficulty, inasmuch as searching for a tie on a ureter deep in the pelvic cavity several days after an extensive resection, is a problem attended with considerable difficulty. Even in animals we have had trouble in removing the ligature, owing to its being buried within the ureteral wall, and in a fair proportion of the experiments our attempts to deligate without cutting the ureter, in spite of our strictest attention, were unsuccessful. In several instances in which I have known of its being done clinically, the ureter has been incised with a resulting fistula, or a ureteral vesical anastomosis performed at the time.

Such anastomoses at best are not entirely satisfactory and are frequently attended with contraction and obstruction, and certainly are difficult under the circumstances. Furthermore, the danger of hemorrhage must be considered, since the ligature which implicates the ureter also includes within it the uterine vessel.

Faced with these difficulties and occasional dangers, we undertook the problem above described and found, as some of you will remember, that the first indication of the formation of a lumen

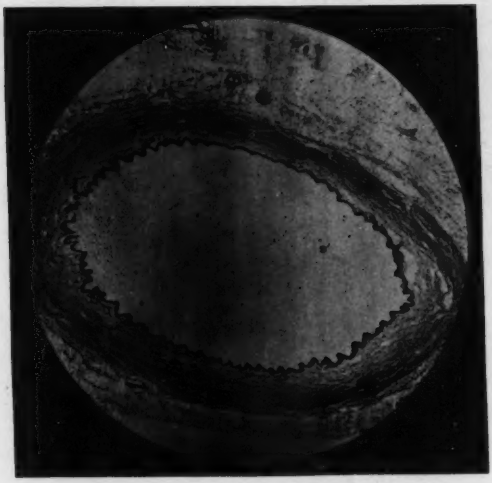


FIG. 4. URETER ABOVE LIGATION

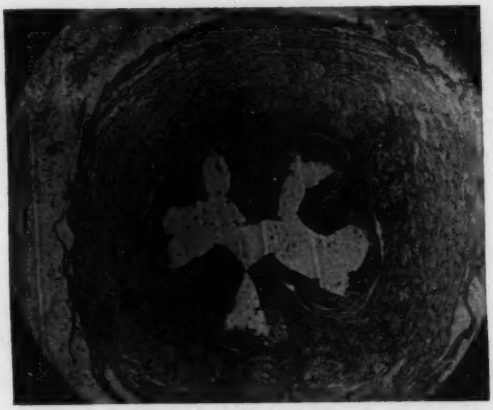


FIG. 5. URETER BELOW LIGATION

through the site of ligation occurred at the fifth week (fig. 2). There was at this time a budding out of epithelium both from above and below, growing toward each other, and a definite column of epithelial cells joining them. We also noticed a beginning lumen which seemed to funnel from above. At the end of six weeks the canal had found its way through the connective tissue and had opened sufficiently to allow fluids to be injected through (fig. 3). We will not describe in detail the preparation of specimens or the pathological changes in the ureteral wall above and below the ligature, as they were given completely in the previous report.[1]

At the end of eight weeks the ureteral lumen is fairly well opened and while the gross specimen seems to demonstrate that the site of ligation is considerably restricted, it is universally found that this is more apparent than real, as far as the lumen of the ureter is concerned, since the proportionate size between the lumen of the low ureter and of the compressed ureter is not as much at variance as the ureteral wall would indicate. At twelve weeks the lumen is more open and there is much less pronounced constriction. The wall of the ureter in this segment is thinner and composed of delicate connective tissue, etc.

We have several animals which have gone a year following the ligation. Those which were nephrotomized and in which we were successful in keeping the drainage tube in the kidney in place for several weeks, have remained healthy and well; the sinus has subsequently closed and at autopsy at the end of this time, the kidney on the side corresponding to the ligation has been remarkably well preserved, in striking contrast to the kidney which was not drained behind the obstruction. (In such a case there is, of course, complete atrophy) (figs. 6, 7, 8). The lumen of the ureter is open and free (fig. 9) and a no. 6 catheter passes easily, but the ureter itself is shorter and thicker than a normal one.

The ultimate opening of a ureter following a protracted ligation serves as a demonstration of the amount of damage a ureter will tolerate without the production of a pronounced stricture.

[1] Transactions of the American Association of Genito-Urinary Surgeons, 1915.

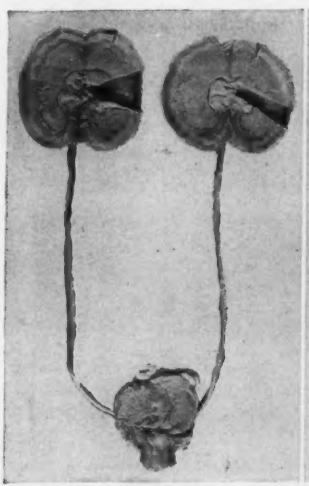


FIG. 6. DELIGATED RIGHT URETER AT END OF ONE YEAR

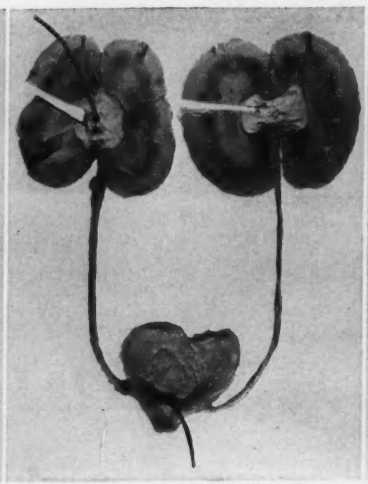


FIG. 7. RIGHT KIDNEY AND URETER AT END OF ONE YEAR

Nephrostomy fourth day, tir left on ureter. (Notice open ureter)

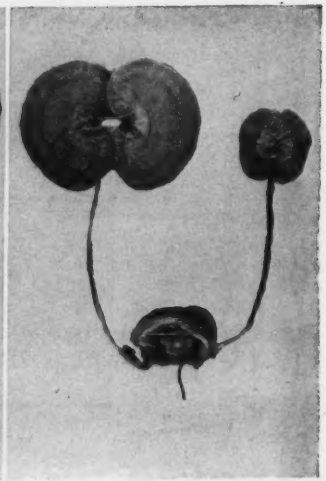


FIG. 8. KIDNEY ATROPHIED AT END OF ONE YEAR

No nephrotomy; ureter open

It also confirms my strong belief that ureteral strictures are not as frequent as one is led to believe; that the majority of them are spasms in the neighborhood of inflammatory processes. This can be beautifully demonstrated, clinically, by the administration of repeated doses of atropine to patients who seem to have a ureteral stricture, they can frequently be easily catheterized with a large catheter after atropine, notwithstanding their previous impermeability.

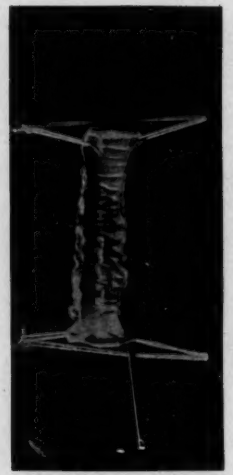


FIG. 9. SECTION OF URETER AT SEVEN MONTHS

Notice open lumen at site below

Effects upon the kidney. We shall not consume time in giving the detailed findings of the kidney complications secondary to complete ligation of the ureter as they were thoroughly described in the previous paper, and have been fully studied by Lindemann, Sollmann, Williams, Legueu, Cohnheim, Pierce, and beautifully illustrated by the splendid work of Barney, which was delivered before this Association; more recently by Reid, by Keith and Pulford and by Johnson. I wish to refresh your memories, however, by showing slides illustrating the various degrees of renal involvement at different intervals following the obstruction (figs.

10 to 16), in order to demonstrate how essential it is that prompt attention be paid to the ligation if there is to be hope of saving the kidney. It should be noted that dilatation of the ureter and kidney pelvis start fairly promptly after the ligation. Reid's work seems to show that the first dilatation is just above the site of ligation. We have not in our experiments seen it confined so definitely to the lower part, but have found it to be general throughout the ureter and kidney pelvis. As you can see from the sec-

FIG. 10. RIGHT URETER LIGATED ONE WEEK

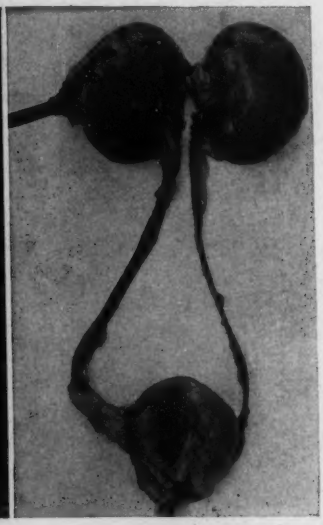


FIG. 11. RIGHT URETER LIGATED ONE WEEK, BUT KIDNEY DRAINED THIRD DAY

tions, there are various grades of hydronephrosis up to the fourth or fifth week, at which time the kidney is seriously damaged, and often nothing of the cortex left but a shell (figs. 14 and 15).

The ureter in all of these ligations has been tortuous, which explains why ureteral catheterization may be impossible even though the ureter has opened. Thus it seems evident that if one hopes to conserve the kidney the obstruction must be relieved,

FIG. 12. SAME AS FIGURE 11 (SECTION)

FIG. 13. URETER LIGATED TWO WEEKS; MARKED HYDRONEPHROSIS

certainly within two weeks, as after that it may be irreparable. This has recently been demonstrated by Johnson who has shown that the functional test may return to normal in an animal whose kidney has been obstructed for no longer than two weeks. The longer the period of obstruction the slower the rate of recovery.

In a series of experiments which have been done to determine the nitrogen content of the blood following single ligation of the

FIG. 14. URETER LIGATED FOUR WEEKS

ureter, we have found that in some of these animals there is a gradual rise of the blood nitrogen until the time the kidney is drained—which was usually the fourth day. Following this, there is a sudden rise, in some instances, but usually a very slight one. Then within two to four days after drainage the blood nitrogen drops to normal and remains so if the drainage is efficient.

FIG. 15. SAME AS FIGURE 14

FIG. 16. KIDNEY AT END OF SIX WEEKS

This restoration of function after a prolonged obstruction has an important clinical significance, and demonstrates to us how careful one should be in suggesting nephrectomy to patients whose kidney function may be extremely low in the face of retention. We should always try to relieve the retention conscientiously before attempting to sacrifice a kidney, as so frequently kidneys which seem functionally hopeless have been restored after retention is relieved. Therefore, clinically, we must relieve a kidney of complete retention before the end of two weeks. In double ligation, of course, one should drain promptly after the ligation is appreciated in order to save the life of the individual. In single ligations, however, the problem presents a different aspect. In this instance the life of the kidney alone is to be considered. Shall we allow the kidney to die unmolested or shall we exert every effort to protect it? The difficulties in this phase of the question are manifold. In the first place, since the symptoms may be insignificant, many ligations may pass entirely unappreciated both by patient and surgeon. If they are recognized and appreciated, the surgeon is confronted with these questions: Shall he propose to his patient that there is a surgical complication which he may never become aware of, and which may probably disturb her health but little if at all, if left unrelieved; or shall he suggest another operation which though attended with some risk and more suffering, will in all probability give her much greater renal capacity. Again is there danger that another operation, several days after pelvic surgery would be too hazardous? Are the results that we can offer commensurate with the danger and difficulties of the problem? and which phase of the problem presents itself as the most suitable avenue of approach for the ultimate relief of renal embarrassment and restoration of health?

We shall attempt to answer these questions in our summary. We feel entirely convinced that cat gut will not be absorbed rapidly enough to protect a kidney against complete destruction, so that in double ligation a prompt response is necessary. Our experiments and clinical observations seem to indicate that a ureter which has been ligated with cat gut will eventually open

sufficiently to allow complete drainage from the kidney, and that this opening takes from six to eight weeks or more during which time a kidney will be completely destroyed unless protected by drainage, either through the kidney or through the ureter.

Faced with the difficulties of deligating a ureter, such as reopening an abdominal wound and searching for a small tie in a pelvis imbedded with plastic exudate, and the ureter incorporated with the uterine vessels, with the consequent danger of hemorrhage and the possibility of cutting the ureter with a resulting fistula, and certainly a much more serious operation than a double nephrostomy, and with the same difficulty attending a ureterovesical anastomosis, with the exception of hemorrhage, we are of the firm belief that the safest method of protecting the individual is an immediate double or single nephrostomy.

We are impressed that the dealing with single ligation such as we propose may not have as large a field of usefulness as it merits. In the first place, the diagnosis of single ligation may prove difficult, as the symptoms may be slight. If, however, a woman who has undergone pelvic operation complains of pain in the kidney, which is usually about the third day, and this kidney is found to be enlarged and palpable—not having been so beforehand—such symptoms are highly suggestive of ureteral ligation. If the patient's condition would warrant it, a ureterogram would clinch the diagnosis. It is then for the surgeon to decide whether it is better for the patient to allow the kidney to die or to try to protect it. It seems certain that no reputable surgeon would be embarrassed in making this situation known, provided there is a fair chance of saving the kidney. The danger of a unilateral nephrostomy should be extremely slight, as it can be done under local anaesthesia and certainly quickly under gas.

With such a fair chance of the ureter's opening and the kidney's healing in good condition, we believe that this should be the procedure. Granting that it may not be successful, even then the patient's ultimate condition is as good as it would have been had the attempt not been made, and we would have fulfilled our chief urological duty, namely an attempt to conserve the renal parenchyma.

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DISCUSSION

Dr. J. D. Barney, Boston, Mass: I have nothing to add to or subtract from Dr. Caulk's most admirable paper. I simply want to call attention to the fact that the work which he has done on animals is a mighty difficult problem. It is not like the experimental surgery in other lines. For some reason or other experimental surgery on kidneys and bladders in dogs is attended with a great deal of difficulty, as I found some time ago. Infections take place and the dogs die, and they do not leave the tubes in, and they will not help you at all. I have nothing to add or subtract. It is a most admirable piece of work and carries to the ultimate conclusion work which I was doing some time ago, and which I hoped to do the way he has done it.

Dr. H. G. Bugbee, New York, N. Y.: I have seen eight cases in which one or both ureters were ligated during pelvic operation. In two cases both ureters were ligated, and in one case the ureter on each side was twice ligated. I have only seen one kidney destroyed by this procedure. In all of the cases, with one exception, a second operation was performed as soon as the diagnosis was made. It is not difficult to find the point of ligation, if you use a large ureteral catheter as a guide. By using this ureteral catheter the operator with his hands in the pelvis can very easily find the point of obstruction. This is an important point, because ureters may be ligated more than once, and when one ligature has been removed the catheter can be advanced thus a certaining the presence of another ligature above it. For this reason I would not agree with the choice of nephrostomy in these cases. One case which I mentioned in discussing Dr. Barney's paper at Chicago last year, both ureters were included in a wide cicatrix following a cauterization of the cervix; both uterers had apparently been shut off for eleven days. We cut off both ureters

close to the bladder and implanted them into the fundus of the bladder; the kidneys began to functionate at once, although the patient had not passed any urine for eleven days.

Dr. W. W. Townsend, Burlington, Vt.: I wish to call attention to the paper of Dr. Frontz. I believe the condition of congenital malformation of the posterior urethra to be very much more common than it is supposed to be.

In the Service we had three types of "bed-wetters." (1) The malingerer, who wet the bed to get into the hospital and thus avoid duty. (2) The bed-wetter that showed no definite pathology other than that of a neurotic. (3) He that showed a definite pathology in his posterior urethra similar to that described by Dr. Frontz.

In a series of some eight or ten cases, which were referred to me at the Base Hospital at Camp Dix, we found in the posterior urethra diaphragmatic folds and abnormal changes in contour causing obstruction, which produced the trabeculated, hypertrophic bladder with its large residuum. The nocturnal and diurnal enuresis being simply a dribble from the over distended viscus.

These patients in civil life had consulted their local physicians without receiving diagnosis or curative treatment and when drafted into the army came with their leg urinals and rubber sheets. Orders from the Surgeon General's Office prevented our operating on these cases and they were discharged from the Service.

Dr. Benjamin S Barringer, New York: I am inclined to think that Dr. Bugbee's report of a case refutes his own point of view; if a patient has been anuric for eleven days he is, I think, to most of our minds, an extremely sick man. And it seems to me not wise to do an operation, a re-implantation of a ureter into a bladder, which would probably take an hour, when you could do a double nephrostomy in possibly fifteen minutes.

I have seen only one of these case which was almost an exact duplicate of the one that was cited; that is, the patient had

a hysterctomy and ligation of the ureters manifestly bilateral. I saw her, I think, three days after the ligation, and attempted to pass a ureter catheter. It is perfectly possible that the ligature may not be tight enough around the ureter to prevent the passage of a ureter catheter, yet may be tight enough to prevent the passage of urine. So I think a definite attempt should be made to catheterize the ureters in these cases, and if that fails the operation of choice would seem to be a double nephrostomy.

Dr. Francis R. Hagner, Washington, D. C.: I want to add a word in citing a case of bilateral obstruction of the ureter, it was not tied off but it was practically the same condition, where both ureters were obstructed by a cancer of the uterus, following the use of radium. One of them had probably been obstructed for some time, the other one about eight days before I saw the patient. Her ureter was catheterized three times, I would leave the catheter in for twenty-four hours, and during that time from 2 to 4 ounces of urine would pass from the ureteral catheter. This woman lived twenty-eight days, altogether she did not void more than 12 ounces of urine in that time, the only time she voided urine was at the time the ureteral catheter was in the ureter. They refused any operation. I wanted to do a nephrotomy on her but they would not have it done. At the autopsy as I described just now, the whole pelvis was just as if melted wax had been poured in.

Dr. J. H. Cunningham, Jr., Boston, Mass.: I can recall three cases of bilateral ligation of the ureter, in which I opened both kidneys. Two of them died and the other one recovered, and the fistula healed, as Dr. Caulk states.

In regard to Dr. Frontz's paper, I have a specimen which is illustrated in Watson and Cunningham of the condition of which he speaks. It was a specimen recovered from a child born dead, and while at that time I did not correlate it with the conditions he has described, as I have heard his paper there is no question in my mind but that it is this exact condition.

Dr. JOHN R. CAULK, St. Louis, Mo. (closing): I have only to say, Mr. Chairman, that I believe we all agree that deligation would be the ideal way, but as Dr. Barney, I believe, or Dr. Barringer has said, you offer a patient a very serious problem when you return three or four days after, or four or five, or even eleven days after a double nephrostomy, to offer her another culminating operation to correct it. Now, with this other method, which is perfectly simple, as far as surgery is concerned, and which gives results which really are as good as these of deligation, it seems to me your problem is to relieve renal pressure, and not add any more surgery to the patient than you can possibly help.

Concerning the single ligation, I do not believe we are going to hear much from it, for the simple reason that unfortunately the symptoms are passed over and the kidney allowed to die. But I am convinced from this work that the kidneys should not be allowed to die; that it is perfectly simple to open them, and if they do not get infected, and usually they will not, that the patients stand a perfectly good chance of having a fairly well preserved kidney, of having two kidneys instead of one; and there is no question about the fact that even though they can live with one kidney nicely, that I personally would rather have two, as long as I can keep them.

TORSION OF THE CORD

F. R. HAGNER

Washington, D. C.

From the literature it appears that only thirty cases of torsion of the cord where the testicle was in the scrotum have been reported. It has been our fortune to have three cases; one in which the diagnosis was not made before operation, one diagnosed before operation and a third not operated upon.

Case I. A farmer, aged twenty-eight, came to Garfield Hospital in 1906 complaining of pain in the testicle. Previous history was negative for any urethral infection and his previous health had always been good. He had jumped from a load of hay to the ground and felt a sudden pain in his testicle, this accident occurred seven days before he came to the hospital.

At the time of admission his temperature was 100° and during the few days he was at the hospital before the operation his temperature varied from 99 to 100°. Careful examination of his urinary tract showed no evidence of infection, his right testicle and epididymis were very slightly swollen and a little sensitive upon palpation, the cord not indurated. The opposite testicle normal; a leucocyte count of 16,000 was noted.

After observing this patient for several days and no improvement occurring in his condition, on the twelfth day after his traumatism an exploratory incision and exposure of the testicle was advised and performed. When the tunica vaginalis was opened a small amount of blood tinged fluid escaped—a black gangrenous testicle very slightly enlarged was noted lying free in the tunica vaginalis—no attachment of the mesorchium could be found (see fig. 1). The incision was carried up the cord and at the top of the tunica vaginalis the cord was found twisted one and one-half times; complete thrombosis of the vessels below the twist and normal circulation above. The cord was tied above the twist and the testicle removed. The cord at point of the twist was smaller than the diameter of a lead pencil.

This patient made a rapid recovery.

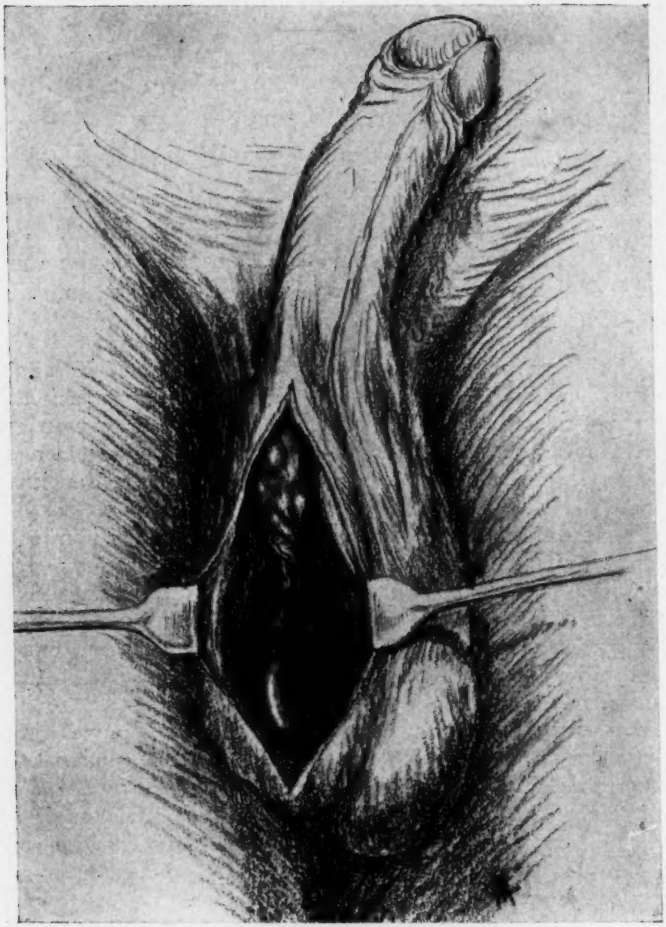


FIG. 1. TORSION OF THE CORD WITHOUT SWELLING AND ENGORGEMENT DUE TO SUDDEN AND COMPLETE CUTTING OFF OF THE BLOOD SUPPLY

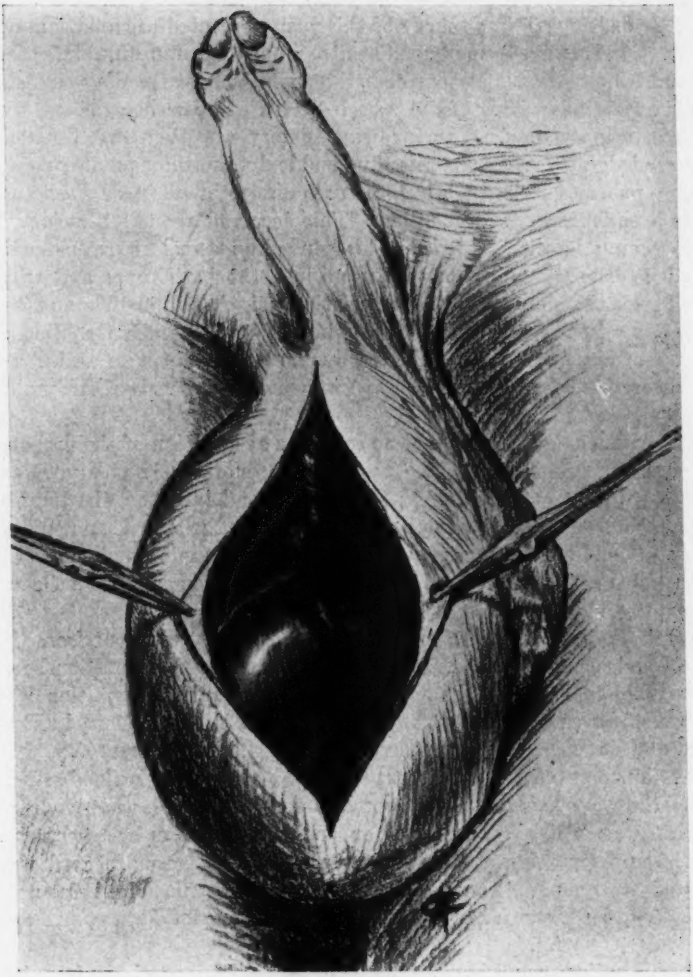


FIG. 2. TORSION OF THE CORD WITH GREAT SWELLING AND ENGORGEMENT DUE TO THE INCOMPLETE CUTTING OFF OF EITHER THE ARTERY OR VEIN AT THE TIME OF THE TORSION

Case II. Patient twenty-nine years old, seen in consultation with Dr. Louis Mackall in January of this year, presented the following history. Had always been in good health, no history of urethral infection. When I first saw this patient he had been in bed for ten days suffering from a painful swelling of the testicle—a little larger than the two fists of an ordinary man. The following history was elicited. Ten days ago while lying on a sofa he raised up suddenly, this movement caused a severe pain in his right testicle, the pain disappeared after a short time only a slight soreness remaining. This occurred about ten o'clock in the evening, he then returned to his home, had sexual intercourse with his wife, shortly afterwards he went into the bath room and while sitting on the closet had an excruciating pain in the testicle and was found in a fainting condition by his wife. He was seen by Dr. Mackall next morning and was thought to have an epididymitis. Local measures were used for ten days before I saw him, a diagnosis of epidymitis having been made.

On examination I could find no evidence of infection of the prostate or vesicles; urine clear. The testicle was enormously enlarged, exquisitively tender to the touch; the skin red and inflamed, the induration being so great it was impossible to separate the testicle and epididymis. There was distinct evidence of fluid in the tunica vaginalis. On palpation the spermatic cord was only slightly thickened above the enlarged testicle.

While the appearance of this case was absolutely different from the case I had seen before and realizing the rareness of the condition I felt reasonably certain that the only thing to cause such a condition was torsion of the cord. The patient was advised to go to the Garfield Hospital and have the testicle removed—this was done the next day. At operation the tunica vaginalis was filled with almost black bloody fluid. When this was evacuated the engorged gangrenous testicle was seen loose in the tunica vaginalis, no connection by the mesorchium being present. At the upper portion of the tunica vaginalis the spermatic cord was twisted three complete turns, the circulation above this point being normal. The cord was tied off and the testicle removed. Patient's recovery was uneventful.

As this patient came from an educated family I tried to learn from his mother if there was any history of an undescended testicle in infancy. The mother informed me that as far as she knew he had always been normal from his birth.

Case III. The third case was an infant less than a week old—the second day after his birth there was noticed a swelling of the right side of the scrotum, the skin appearing discolored with extravasation of blood. Three days after this was noted I examined the child finding the testicle hard, about four times the size of its fellow and slight infiltration of the cord. A diagnosis of thrombosis of the vessels was made —probably due to torsion. This infant was not operated upon—local applications being employed. The enlarged testicle gradually became smaller. A few months later I operated on the child's opposite side for radical cure of hydrocele. This testicle appeared normal. The opposite testicle had completely disappeared.

As Scudder of Boston remarked in his article on Torsion of the Cord—that twisting of the pedicle of all the organs of abdominal origin can occur, the testicle is no exception and torsion may occur either in an undescended testicle or in a testicle after descent. In nearly 50 per cent of the reported cases the organ has been undescended, this has been thoroughly gone into by Scudder in the Annals of Surgery, 1901. I am not going to take up cases of this character as much more has been written on this phase of the question than in the cases that have occurred with the testicle apparently normally placed in the scrotum. It is probable from the report of these cases that torsion of the cord never takes place in a perfectly normal testicle. The first cause is a long mesorchium or entire absence of the mesorchium which condition was present in both of the cases I have operated on.

Rigby and Howard in the Lancet, 1907, in connection with fully descended testicles give three causes. First, the abnormal attachment of the common mesentery and vessels to the lower poles of the testis and to the globus minor so that the testis is attached by a narrow stalk instead of a broad band; second, elongation of the globus minor; third, capacious tunica vaginalis.

The exciting cause may be straining, sudden change in position and possibly too violent copulation as is mentioned by one author. Dr. Smith refers to a case in the Massachusetts General Hospital that came on during sleep. Van der Pool reported a case where the patient learned to untwist the torsion himself.

The pathological findings in torsion are described as follows, more or less: Bloody fluid is found in the tunica vaginalis; the

spermatic cord is thrombosed below the twist and normal above; the twist may consist of one-half a turn or four and one-half turns. In the last case we had there were six half turns, Dr. Fuller, my associate, being careful to count the number of turns necessary to untwist the torsion. The testicle and epididymis is described as being swollen, engorged with blood and indurated. This is probably true in the majority of cases but in the first case here reported the testicle and epididymis were enlarged only slightly, there being very little fluid in the tunica vaginalis and only slightly blood tinged.

I feel as far as I can tell in reviewing this subject this condition has not been described before, our second case fits exactly the description given by several observers, namely great engorgement, a large amount of bloody fluid in the tunica vaginalis. I believe that the swelling and engorgement is dependent on whether the twist occludes both the artery and vein simultaneously or whether the vein is first obstructed and then the artery or vice versa.

This seems a rational explanation to me and can be the only thing to account for the microscopical findings of these two cases. In both, the testicle was lying perfectly free in the tunica vaginalis, suspended only by the twisted pedicle, no mesorchium being present. In the second case operated on, an examination shows it is possible to make two full turns of the remaining testicle inside of the tunica vaginalis without discomfort to the patient. Probably there is an absence of the mesorchium as on the side operated that accounts for this increased mobility.

Third case reported, that of a new born infant, although no operation was performed, the testicle has completely atrophied and disappeared and from the condition of the cord and testicle I feel certain that thrombosis of the vessels had occurred. Torsion is surely the most rational explanation of this lesion in an otherwise perfectly healthy infant.

An early operation should be performed on these cases in the hope that the torsion can be untwisted and the circulation reestablished. This attempt has been made but in every case the testicle has atrophied, possibly because the condition has not been recognized promptly.

DISCUSSION

Dr. H. G. Fuller, Washington, D. C.: Referring to the second case in the report given by Dr. Hagner, I might say that I assisted at this operation and, therefore, had an opportunity to see presented the condition there on exposure of the tunica vaginalis, and the opening of the sac. It was perfectly obvious on the inspect on of the tunica vaginalis and the opening of same that he had a testicle which was destroyed and, of course, there was nothing to do but remove the same. As Dr. Hagner has stated, there were three full turns or six half turns.

He has also referred to the possibility of there being a similar congenital anatomical deformity of the fellow organ. This being the case it is very much to be hoped that there will be no similar accident that will bring on an impairment of that organ. It is obvious to us all just the condition that is caused on torsion of the cord, therefore the only salvation of the patient when suffering, is to have the surgeon called promptly, one who can make a prompt diagnosis, followed by an immediate operation. That would be the only chance for the patient.

Dr. E. L. Young, Jr., Boston, Mass.: In connection with Dr. Cabot, or in the clinic at the hospital or in my own work I have seen six of these cases, and one of them I thought was of interest, in speaking of the possibility of untwisting. It was a fellow who had had a number of attacks of pain in the testicle, without known cause. No one had been able to tell him why he was having trouble until he had an attack which drove him to operation. Apparently that testicle had been twisted a number of times, but not enough to destroy it, and then had untwisted, because there was a certain amount of atrophy; at the time we operated the attack had been going on for, I think over twenty-four hours, and removal had to be done. Of the six cases, four of them had the initial attack at night, and in all four they were

assured by their family doctor that they had gonorrhoea and that it was an epididymitis.

So it seems worth while emphasizing the possibility that Dr. Hagner speaks of, that an early diagnosis might result in the possibility of untwisting the lesion before complete destruction had taken place.

Dr. ARTHUR L. CHUTE; Boston, Mass.: I should like to report a case of torsion of the cord that came under my care that was easily untwisted. It occurred in a student of nineteen, a boy of good habits, who had gone to bed perfectly well. He was waked up about four in the morning with tremendous pain in the right side of the scrotum. He was seen by his family physician who gave him some morphia but the pain continuing I saw him two hours later, about six o'clock that morning. The right side of his scrotum was swollen and exquisitely painful; the condition seemed evident and I made an attempt to untwist the cord which was successful. I think I twisted it in the direction in which the hands of a watch move. The patient had immediate relief; and, within four or five minutes, was so comfortable that he went off to sleep. His physician told me some years afterward that there had been no recurrence. The testis in this instance was well down in the scrotum.

I saw another man about six or seven weeks ago who had on his left side a testis that was not wholly descended and which was in the inguinal region; this was twisted and giving him terrific pain. I was unable to completely untwist this but could do so sufficiently to give him relief. As this testis was in the groin and more or less atrophied, I removed it two or three weeks later. In this instance the cord as seen at operation seemed to have a turn and a half which was more or less fixed.

Dr. GEORGE S. WHITESIDE: May I just ask Dr. Hagner if he was able to predict the possibility of remaining testicle, in his second case becoming twisted, why it would not be advisable to fix it so it could not twist?

Dr. W. C. QUINBY, Boston, Mass.: My resident surgeon, Dr. O'Connor, has been interested in this subject, his attention being called to it by two cases which he has operated on during last winter, and he finds from reports in the literature that those cases which occur and can be untwisted, in the majority of instances later on recur; so that many subsequently must be removed. The suggestion just made by Dr. Whiteside is most logical; if a testicle has once undergone torsion, the proper surgical treatment of it is fixation of the testicle in the tunica.

Dr. FRANCIS R. HAGNER, Washington, D. C.: I have nothing to add except to say I suggested the advisability of anchoring his remaining testicle, but he was not anxious to have this done.

SECOND DAY, JUNE 17, 1919

ON THE EFFECT OF PROSTATE FEEDING ON THE DEVELOPMENT OF TADPOLES[1]

DAVID I. MACHT

From the Pharmacological Laboratory, Johns Hopkins University and the James Buchanan Brady Urological Institute, Baltimore

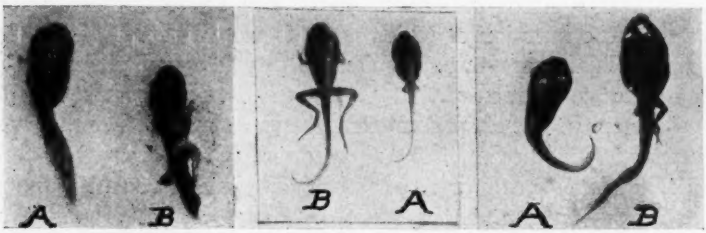
The importance of endocrine glands has been more and more recognized in the last two years and numerous papers and books have been written on the subject. Among those glands concerning the function of which there is very little known in this respect is the prostate. While the physiological properties of the *external* secretion of that gland are generally recognized as essential for the life of spermatozoa, the question whether the prostate also furnishes an *internal* secretion is still in dispute. The chief evidence in favor of an internal secretion of this gland is the work of Serralach and Pares. These authors found that prostatectomy in dogs was followed by a gradual atrophy and degeneration of the function of the testes and that these defects could be prevented by injections of glycerine extracts of prostate. In connection with a physiological and pharmacological study of prostatic extracts which the author has been conducting for some time, he observed the effect of feeding prostate on the growth and development of tadpoles. In the present paper, it is proposed to give a preliminary account of these observations which turned out to be of unusual interest.

In the experiments performed, frogs' larvae were placed in convenient receptacles and some of them were fed desiccated prostate of the ram, bull, and other animals, while others were kept as controls and given other glandular extracts or tissues. In every experiment tadpoles of exactly the same age and size were selected. These were kept in the same kind of vessel in equal parts of

[1]Read by invitation before the meeting of the American Association of Genito-Urinary Surgeons, Atlantic City, June, 1919.

water and under exactly the same conditions of light and temperature. The following species of frogs' larvae were studied: *Rana sylvatica, Rana palustris,* and *Rana catesbiana.*

The effect of feeding prostate gland to the larvae was very striking and interesting. It was found that the metabolism of the tadpoles was stimulated by the prostate feeding and that their metamorphosis was hastened. In other words, the tadpoles developed legs earlier than normally and were soon transformed into frogs. At the same time the size of the tadpoles was not



1 2 3

FIG. 1. RANA SYLVATICA

After two weeks' feeding ram's prostate. A, normal; B, prostate.

FIG. 2 RANA PALUSTRIS

Two weeks' feeding of desiccated prostate (ram). Note metamorphosis and size. B, prostate; A, normal.

FIG. 3. RANA PALUSTRIS

Bull's prostate fed May 9–26. Note metamorphosis and increase in size. A, normal; B, prostate.

diminished and indeed in many cases the tadpoles also increased in size. This effect was produced by feeding the desiccated prostate of the ram (Armour) and also the desiccated prostate of bulls and in a few experiments followed the feeding of human prostate.

The above peculiar effect of prostate feeding on the development of tadpoles has never been observed or reported before. In connection with these observations, we must of course recall the classical experiments of Gudernatsch who found that the

feeding of thyroid hastens the metamorphosis of frogs' larvae. Unlike the case of the thyroid, however, the prostate does not produce a shrinkage or dwarfing in the size of the tadpoles, but on the contrary usually stimulates their growth; while the thyroid, as is well known, from the experiments of Gudernatsch, Rogoff and others, produces a very marked atrophy or shrinkage of the organisms.

Control experiments made with all kinds of desiccated glands —ovary, corpus luteum, parotid, liver, testes, etc.—failed to produce the remarkably stimulating effect on metamorphosis shown by the thyroid and the prostate.

Following the experiments on frogs' larvae, the author made further observations on the larvae of the toad, *Bufo lentiginosus*, and here again it was found that the toad larvae which were fed on prostate gland metamorphosed more rapidly than the other tadpoles which were of the same age and size at the beginning of the experiment. The author then was fortunate in obtaining recently laid eggs of the salamander, *Amblystoma punctata*. As soon as the larvae were hatched, observations were begun on the effect of prostate feeding on their growth and development. Ordinarily, these salamander larvae grow and metamorphose very slowly (several months). It was surprising, therefore, to find that feeding of the prostate gland induced changes in the organisms in as early as two weeks time. It was noted that those larvae which were administered the prostatic extracts increased in size and began to develop their hind extremities at a very early date. In other words, the effect on salamander larvae was the same as in case of the frog and toad.

The above observations are still in progress, but the author has collected a sufficient number of experiments to be able to assert that the peculiar effect of the prostate gland when fed to tadpoles is not an accidental one but is a distinct and definite physiological phenomenon. Such a phenomenon speaks strongly in favor of an internal secretion of the prostate gland. The author is conducting further observations concerning the effect of prostate feeding on rats, kittens, and other animals. The more complete data will appear in due time in the Journal of Urology.

DISCUSSION

Dr. WILLIAM E. LOWER, Cleveland, Ohio: I should like to inquire about the composition of the prostate, as compared with the thymus. I understood the speaker to say that the thymus and the prostate gland produce practically the same result; i.e., a rapid increase in the growth. Does this result bear any relation to the composition of the glands? How does Dr. Macht explain the fact that the prostate of the steer does not produce the same result as in the bull? Is there something in the testicular secretion which is added to the prostate in some way, so that the one grows so much more rapidly than the other?

Dr. DAVID I. MACHT: The thymus has been found to increase growth, but never to hasten metamorphosis. In fact, it inhibits metamorphosis. As to the chemical composition I do not know, except as far as the iodine content goes. Neither the thymus nor the prostate contain much iodine. I merely mention that to show that this effect of the prostate upon development is not such a simple matter. It is a compound containing iodine, but whether iodine is the essential factor in hastening or producing this change is a question.

In regard to the steer and bull I cannot say, but I believe that after castration there is a degeneration, more or less, of the prostate, and I attribute the difference in action between steers' and bulls' prostates to this difference in composition. Probably the active principle is diminished, if not entirely absent in the steer.

Dr. EDWARD L. KEYES, Jr., New York, N. Y.: I assume, Mr. Chairman, that Dr. Macht does not want to start us going the way in which I think I can very faintly remember the medical profession was going in the late 80's, over Dr. Brown-Séquard's (?) experiments. It seems to me that we should be very slow

to draw practical inferences from Dr. Macht's interesting experiments. I therefore venture to ask whether he is inclined to draw practical conclusions from his own work, or not.

Dr. MACHT: I said it was a little too early to make any suggestions therapeutically, but one may imagine, I said, such a use made of the prostate. I may add that I know of at least on-case where the feeding of prostate, in case of a prostatectomy has led to very beneficial results. A prominent man in Baltie more had a prostatectomy done, and he has not felt well since. He began taking some prostate tablets, and claims he feels better. It is not impossible that he may get some of this hormone from eating the desiccated prostate, and in that way, may be relieved, of his symptoms just as when we feed thyroid in case of hyperthyroidism. Of course, I cannot say anything definite on the subject, but it ought to be tried out as it is harmless.

Dr. HENRY H. MORTON: I have noticed for several years that after doing prostatectomy on old men they would feel very much better at first after they began to be up and about, but several of them have died suddenly with apoplexy a few weeks or months after they had taken up their usual routine method of life, and the thought occurred to me that perhaps in taking out the prostate we may have removed an organ which forms some internal secretion which is necessary to the well-being of the body, and that without this internal secretion made by the prostate the vasomotor system suffers a disturbance which leads to high blood pressure.

So far as I know, this particular line of thought has never been investigated but these experiments of Dr. Macht's would rather seem to corroborate this idea. It is a subject well worth investigating.

Dr. V. D. LESPINASSE, Chicago, Ill.: The question of an internal secretion of the prostate has been worked out by Dr. Percy of Galesburg, purely from a clinical standpoint. He

insists that he has demonstrated clinically, that the prostate has an internal secretion. These patients have what he calls a male menopause, with symptoms somewhat similar to the female menopause and these vague symptoms are relieved by the administration of the dried bull prostate. I never subscribed whole heartedly to it myself, but just mention it as a matter of interest in this connection.

Dr. GEORGE K. SWINBURNE, New York: If you operate on your patients you will find you remove the tumor, and not the gland.

Dr. DAVID I. MACHT: I just want to emphasize that I do not want to go on record for the present in regard to the therapeutic applications of this drug at all. I merely came to state as a fact these observations on tadpoles.

PRESIDENT SCHMIDT: I am sure we are indebted to Dr. Macht for bringing up this interesting subject.

OBSERVATIONS FROM A SERIES OF SUPRAPUBIC PROSTATECTOMIES

HOMER G. FULLER

Washington, D. C.

Some deductions from a study of an interesting series of fifty cases of suprapubic prostatectomies operated and treated in association with Dr. Hagner. The patients ranged between the ages of fifty-six and eighty-nine years and naturally varied greatly as to their physical condition at the time of instituting treatment.

Cases today come to the surgeon at an earlier age, with a less serious condition to deal with, with a much less aggravated accompanying cystitis, a less hypertrophied bladder mucosa, and fewer with the complication of pyelitis or pyelonephritis.

This means that our operation is becoming more and more elective and less and less an operation of immediate necessity. The more prostatectomy becomes to be an elective operation the greater still will be the increase in the percentage of recovery.

The cases embraced in my recent study are fortunately quite free from mortality, only one ending in death, this in a man in which the prognosis seemed excellent, whereas many recovered when the outlook seemed exceedingly grave. To gain the results that our patients are entitled to necessitates a thorough examination, consideration and study of each individual case with appropriate care and attention to prepare him for operation and equally diligent care after operation.

The examination necessarily goes beyond a careful instructive cystoscopy. The cystoscopy more than clinches the diagnosis, it reveals the hypertrophy, its character, shape, location of greatest extent, the condition of bladder neck as regards contracture, the presence or absence of infiltration of bladder mucosa in floor of the bladder, presence or absence of stones and tumors, and as to whether any or all of the urinary residuum is due to diverticula.

This is all of value, as we know on entering the bladder what to expect and we are prepared to meet it. In three of the cases under consideration the cystoscope showed a greatly contracted bladder neck with a nubbin of prostatic growth (which afterward was felt to be very sclerotic) so located as to be cared for by the use of Young's prostatic punch operation through a perineal incision—a perineal incision being deemed expedient to guard against any possible hemorrhage.

The prostatic punch was used in a fourth case where we had removed an adenomatous prostate eight years previous in which there was a return of obstruction and residuum; every examination pointed so strongly to the returning growth being malignant that the patient's age eighty-three and very poor rapidly failing general condition precluded the radical operation advised in malignant cases. The tissue removed was reported from the laboratory as being adeno-carcinomatous, the findings being benign eight years previous.

A thorough general examination should be the fortune of every patient and if any question arises as to any organ's efficiency a reliable internist should be consulted to advise as to the benefit of any delay and to gain the benefit of treatment both before and after operation. By such precaution often those in precarious condition can pass safely through a prostatectomy. I recall especially one case not included in this series where the patient was suffering from a mitral and aortic insufficiency, an emphysema of the lungs and parenchymatous nephritis. After the internist had pronounced him as greatly improved the second stage of a two-stage suprapubic operation was performed and the patient went on to a recovery; the character of his complication however interfered with a speedy uninterruped recovery.

The condition of the kidneys is of vital interest to the genito-urinary surgeon in planning a prostatectomy and a problem he must cope with before proceeding. Has the patient pus kidneys? If so plans must be mapped out to have this prove as little a handicap as possible; any form of nephritis must appropriately be cared for and the value of the kidneys as regards their power of eliminating solids must be accurately computed. I cannot

speak too highly of the work of Rowntree and Geraghty in the use of phenol sulphon phthalein for renal efficiency estimation, in border line cases however the urease test has its place, but for general use the phthalin test is very valuable. Any deficiency of a degree sufficient to raise doubt should call a halt and lead to overcoming the trouble to as great a degree as possible. A pyelitis in addition to medical treatment may possibly be helped by administering an autogenous vaccine prepared previous to operation.

The functionating power of the kidneys is of extreme importance and should be accurately estimated in all cases—the computation may and has often with us postponed the date of the second operation. A low percentage has occurred in twelve of our cases, the percentage varying from 12 per cent to 25 per cent in seventy minutes, this was brought up to from 22 per cent to 35 per cent within time that varied from seven days to four weeks. This improvement was brought about through general dietetic care, rest, renal stimulants and most important of all the relief afforded the kidneys through the first stage of the operation, namely opening and draining the bladder with regular daily irrigation of the viscus, By this the back pressure has been removed and the kidneys are relieved of the strain forced upon them by the prostatic obstruction and the often resulting hydronephrosis. So too are the kidneys relieved of the toxins that are being constantly absorbed from the infected residuary urine. This I feel to be one of the great advantages of the two-stage suprapubic prostatectomy. As indicated from time to time, phenol-sulphon-phthalein tests can be made and the result serve to determine the expediency of the second step of the operation. We have tried drainage of the bladder by tieing a catheter in place and I cannot emphasize too strongly its disadvantages as compared to the suprapubic drain. Cases have come to us when the very low (less than 4 per cent) phthalein test showed the patient then to be in extremis—too critical to think of performing any operation unless improvement manifested itself through other treatment. These few cases have all emphasized the reliability of the phthalein test all dying in less than forty-eight hours. Of the

fifty cases operated and submitted to the functional kidney test, ten varied from 12 per cent to 22 per cent; two from 22 per cent to 25 per cent; fifteen from 25 per cent to 30 per cent; twelve from 30 per cent to 40 per cent and eleven from 25 per cent to 57 per cent. Those giving the lowest output, as would be imagined were those cases showing complications and the ones that had gone on for months and years with their sufferings only to finally yield to the preferable of the two inevitable courses.

Great attention must be given to the patient's general condition even when the kidney test may invite a proceeding which other conditions may negative. One case so thoroughly illustrates this as to warrant referring to it briefly—patient age eighty, two, thin, poorly nourished, conspicuous arteriosclerosis, a sufferer for years and a catheter victim for six months prior to operation. Just prior to being seen he had suffered greatly through questionable advice and a suprapubic cystotomy was performed as an emergency relief measure. His general condition was so poor that this simple procedure under nitrous oxide and oxygen anesthesia caused such a shock that he was in extremis for forty-eight hours beginning eighteen hours after the cystotomy. We waited seven weeks before his condition warranted an enucleation of the gland. He then went on to an uninterrupted recovery. It is in keeping to refer to the comfort and rest this patient had as he began to improve. In this connection I remark on his ability to take food; it is so important for the nurses to even stand over these old men urging and even making them take food.

A second interesting case, one of the very low phthalein output, that merits a brief report to show the value or desirability of taking advantage of all our aids, is a man age seventy-six, who had grossly neglected his urinary troubles for years, a very pale, anemic, emaciated man with general arteriosclerosis and tabes, we believed after complete examination his urinary retention was due to prostatic hypertrophy. His general condition improved so slightly that it was six weeks before his phthalein output warranted further operative intervention—during this time he received three intravenous injections of salvarsan and three more after the removal of the prostate. By those attentions to

detail he went on to a very satisfactory convalescence and recovery.

Other advantages of the two stage operation besides the relief of the back pressure on the kidneys which I think in a paper of this character should be mentioned, are, the lessened shock to the patient as compared with that where the cystotomy is immediately followed by the enucleation and the opportunity given the patient to establish an immunity to the infection that is bound to take place in the abdominal incision from the infected urine running over it. Having established an immunity during a two to four days wait, he has at the time of the enucleation one less condition to contend with. He does not have to fight the infection which is an element brought on by the first operation. He has now but one new element, the shock of the second operation.

Success in all these operations rests so largely upon taking advantage of all the knowledge that comes to us and of all the aids available to the profession. In addition to those already mentioned another one is the use of the Hagner bag for controlling hemorrhage at the time of operation, used as we know, in place of gauze packing, forcing the capsule to contract down and to remain, by the pressure of the inflated bag firmly pressing the capsule against the cavity from which the gland was enucleated. Unfortunate post-operative hemorrhage occurred in two patients both of advanced age and both giving evidence of a severe degree of arteriosclerosis. In the case of one, aged seventy-eight, the hemorrhage occurred ten days after the second operation and in the other, a man eighty-nine, fourteen days after the enucleation. Both patients were sitting up and were apparently progressing admirably; in each instance the hemorrhage was so alarming that I was summoned to control the situation. The bleeding was instantly and absolutely controlled by the use of the Hagner bag and a great advantage that made itself so conspicuous at these two critical times was the rapidity with which it could be placed in position and the seeming slight discomfort to the patient. In both cases the bags were removed after two and a half days with no evidence of the return of the bleeding, on the contrary both patients went on to a very rapid convales-

cence. A third possible hemorrhage case was detected before the patient reached his bed, he was returned to the operating room and a larger bag with extra gauze cover installed with complete cessation of hemorrhage.

The one fatality stands out prominently as the patient seemingly had all in his favor; one of the younger patients, physically strong and robust, excellent constitution, good phthalein output, 45 per cent; other organs negative to examination, and the operation went along without any complication, but his whole mental attitude and lack of coöperation led to his wearing himself out and he died seemingly of sheer exhaustion.

Our last two cases are in two younger men one sixty-five and the other fifty-six, both vigorous ideal surgical subjects with high phthalein output 48 and 55 per cent respectively, the first leaving the hospital seventeen days after operation, and the other ready to leave in fourteen days. While the man of sixty-five was a case of complete retention, not having voided for forty-eight hours when first admitted to the hospital, the last case, the man of fifty-six, is a typical elective operative case. I might say he, to my mind, represents the class of cases surgeons will have in the future. He consulted a doctor to learn what condition could account for his burning urination, not being aware of any residuum and not suffering from urinary frequency, never rising once at night until three days before seeking professional advice although having a distinct intravesical prostate, post-prostatic pouch and 14 ounces of residual urine—a bladder capacity of 26 ounces.

In a study of any series of cases it is of interest to all who read a review, to have in more or less detail the operative technique and this I will give after first recording the points of chief interest in the history of the cases. The cardinal symptoms were those of all prostatic hypertrophies, with the exception of the last case, extending over a period of from nine months to fifteen years: frequent, difficult urination in all with a residual varying from 6 to 56 ounces, complete retention occurring in eight cases.

Rectal examination showed varying degrees of enlargement and the cystoscopic examination revealed varying degrees of

extension of the growth into the bladder, each cystoscopic picture presenting its own unimportant variations in addition to revealing information of value to the examiner.

Complications other than varying degrees of impaired renal function elsewhere noted, were stone in three cases, carcinoma in three cases, one not apparent till pathological sections were examined—the other two previously diagnosed and operated by the Young punch method in the hopes of bringing about some amelioration of distressing conditions; one of the latter two being a secondary operation having previously had the gland removed eight years ago. Epididymitis occurred as an intercurrent complication three times and some degrees of incontinence as a sequel in two cases, both these cases having had previous perineal prostatectomies. Another intercurrent complication was hemorrhage ten to fourteen days after operation in the two cases elsewhere described. As to ultimate results, exclusive of the two carcinomatous cases where the operation was palliative in character, in no case is there more than 2 ounces of residual urine, one patient having this much, the others varying from none at all to ½ ounce. Functional results are all good except in the two cases where there is some incontinence—cases both previously operated.

As to the operative technique the patient after being anesthetized and the field of operation prepared has the bladder thoroughly irrigated and then filled through a metal catheter. Placing the patient in the Trendelenburg position a suprapubic incison 2½ to 3 inches in length is made, the muscles and precesical fat are separated and retracted, and the peritoneum pushed well up to permit catching the bladder up with the two bladder clamps between which the bladder incision is made high up almost to the peritoneum—the bladder incision in 1½ to 2 inches, the bladder wall is sutured to the fascia by two traction catgut sutures, a third suture often being placed at upper angle of wound. Care should be taken to have the two lateral traction sutures go through the bladder coats, after the manner of a mattress suture, to tend to have the bladder edges inverted rather than everted; two everted bladder mucous membrane edges meeting fail to knit or are very slow in healing, delaying greatly the closing of

the fistulous tract and predisposing to frequent reopening of the tract. The Marion suprapubic drainage tube is now put in place and held by silk suture, the wound being closed by two silkworm gut sutures. Continuous or interrupted irrigation is now maintained until the patient is so improved as to render the second step of the operation expedient.

At this operation the patient is anesthetized, the drainage tube and temporary sutures are removed. After thorough antiseptic preparation of the operative field and irrigation of the viscus, the bare fore finger of the operating hand is introduced through the incision and down into the prostatic urethra, gently making its way through the mucous membrane to and against the capsule of the prostate, a good line of cleavage can be secured and enucleation of the gland can be obtained by following this line of cleavage with the end of the finger aided by the glove finger of the other hand in the rectum—having the finger tip pointed toward the gland instead of the outer capsule, lessens the tendency to that hemorrhage that follows the rupture of the vessels of the venous plexus. After complete enucleation of the prostate it and its pieces are removed from the bladder by clamps or the fingers, a sound is introduced to aid in determining that the gland is completely removed and no rough edges or tags remain—all such tags must be completely removed and all glandular structure must be removed. During the bladder washing now a special sound is introduced for the introduction of the Hagner bag which bag is partially inflated and by the aid of one hand the bladder mucous membrane is carefully smoothed out at the neck of the bag; now complete inflation and traction of the bag by pulling on the tube that passes out through the urethra causes complete or practically complete cessation of hemorrhage. The inflation is maintained by clamping tube with a hemostat, the traction is maintained by tieing the tube to adhesive plaster with tape at patient's knee. The Marion tube re-sterilized is now reinserted, the bladder freed of any clots, continuous or interrupted irrigation started and the suprapubic wound closed by two or three silk worm gut sutures.

We have been accustomed to removing the Marion drain in twelve to twenty-four hours lessening the pull of the Hagner bag in eighteen hours, deflating it in twenty-four hours and removing it through the suprapubic wound in forty-eight hours. From this time on frequent bladder irrigations are given through the suprapubic wound per catheter. In some cases having an alkaline urine the cystitis and the appearance of the edge of the wound are wonderfully improved by the local use of Bulgaris Bacillus tablets and the internal administration of acid sodium phosphate. The action of these tablets is very striking where the edges of the wound assume an unhealthy sloughy appearance.

A METHOD FOR THE CONTROL OF HEMORRHAGE AFTER SUPRAPUBIC PROSTATECTOMY

B. S. BARRINGER
New York

The following method has been used to control bleeding in some fifty cases of suprapubic prostatectomy for carcinoma and adenoma. After enucleation of the prostate a strip of 2-inch gauze some yards in length is inserted through the open bladder into the bed from which the prostate has been removed. The gauze is packed into the prostate bed with the index finger of the right hand, or with a plain thumb forceps, against the counter pressure of two fingers of the left hand which have been previously inserted into the rectum to aid in enucleating the prostate. Enough gauze is used to overfill the prostate cavity. With the hemorrhage controlled a simple sponge stick is passed into the bladder and the gauzed ball grasped by this. The bladder is now sutured to the rectus fascia and the hole in the bladder sewed up, simply allowing space for the gauze and sponge stick. No tubes are put into the bladder, but the urine finds exit alongside the sponge stick and gauze. The dressings are changed as often as they are saturated. If the bleeding begins again, pressure on the sponge stick controls it.

Packing has long been used to control the hemorrhage after prostatectomy. Before I used a sponge stick attached to the packing, which is the only original item claimed in the above method, I occasionally have had to repack the prostate cavity in order to control bleeding.

This repacking, perhaps some hours after the operation, is very hard on the patient and certainly does not add to his chances of recovery. The sponge stick has done away with the necessity for repacking; the sponge stick is removed from the bladder in twenty-four hours, and the packing in forty-eight hours. A

suprapubic tube may then be placed in the bladder, or, as has been my custom lately, no tube at all is used, the wound being frequently redressed with dry sterile gauze. In placing the packing in the bladder especial attention is paid to the posterior lip of the torn prostate sheath. Keyes and others have pointed out that the severest hemorrhage is likely to come from here. The packing is pressed down hard against this lip. The advantages of this method are:

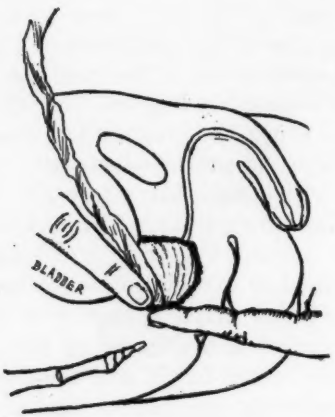


FIG. 1. PACKING INTRODUCED IN PROSTATE NEST WITH INDEX FINGER OF RIGHT HAND AGAINST COUNTER-PRESSURE OF INDEX FINGER OF LEFT HAND [INSERTED INTO RECTUM]

1. It is rapid, so differing from many other methods, most of which probably controlled hemorrhage but took too much time doing so.

2. No special instruments or devices are used. Packing and a sponge stick are always at hand.

3. It stops hemorrhage which may occur both at the time of operation and after operation.

The disadvantages are: (1) The patient keeps wet, the urine simply seeping alongside the packing, and so out. Frequent changes of the abdominal dressings are necessary to keep the patient comfortable. (2) The packing in the prostate cavity

causes a certain amount of pain and tenesmus. This is controlled by morphine.

One of the alleged disadvantages that has been suggested is that the pressure of the packing upon the lower portion of the ureters might cause stoppage of the urinary flow. A very grave disadvantage if true. In none of my cases has there been any suggestion of a temporary anuria or even oliguria. The dressings have always and pretty promptly become urine soaked. Dr. Keyes has had one case in which the kidneys refused to function

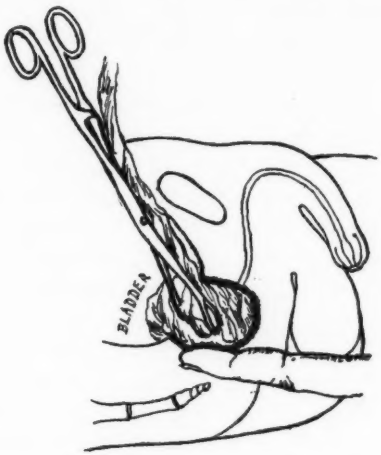


FIG. 2. SPONGE-STICK CLAMPED ON PACKING IN PROSTATE NEST

until the packing was removed. This may have been reflex and might have happened had not packing been used. I simply report it.

I am not at all sure that this method stops hemorrhage more effectively than the Hagner bag. I regret to say that I have not used this ingenious device and cannot therefore judge of the relative merits of the two. Theoretically at least gauze packing should promote clotting of blood better than a smooth rubber surface. In my hands the method has proved to be both rapid and effectual in controlling the bleeding after prostatectomy.

LYMPHO-BLASTOMA (LYMPHO-SARCOMA) OF THE PROSTATE[1]

WILLIAM C. QUINBY

From the Urological Clinic of the Peter Bent Brigham Hospital, Boston, Massachusetts

In 1909, Dr. Charles L. Gibson discussed before this Society the question of sarcoma of the prostate, and at that time was able to find reports of 37 cases. Following this no comprehensive article on this subject appeared until 1917, when Parmenter was able to collect a total of 59 cases. Each of these writers grouped all forms of sarcoma together. Of the different types of tumor, the spindle celled or small round celled sarcoma were in marked majority. Sarcoma, lymphatic in its type of cell, most properly called lympho-blastoma, appears in these series of cases in only three instances. Indeed, in consideration of the fact that normally the prostatic gland contains no lymphatic tissue, it is hard to find logical source for the occurrence of this type at all.

The following case is thus the fourth of this variety of prostatic sarcoma to be recorded.

A married man of French Canadian birth, forty-one years old, a farmer, entered the Peter Bent Brigham Hospital on February 8, 1918, complaining of frequency of urination.

The family history and past history were essentially negative in all respects.

Present illness. Shortly before Christmas, 1917, the patient began to have frequency of urination with burning, more marked at the beginning and end than during the passage of the stream. At this time the urine was clear. By rest in bed under medical treatment for three or four days, the symptoms abated and the patient felt well enough to make a long railroad journey over the Christmas holiday. On reaching his destination, urinary symptoms returned more severe than before and he was compelled to enter a hospital. Here he was treated with hexamethyleneamine, hot enemata, and Sitz baths. He was told that the

[1] Read before the American Association of Genito-Urinary Surgeons, Atlantic City Meeting, June, 1919.

prostate on rectal examination was of normal size at this time but that it was inflamed. After six days he was discharged, relieved. Two days later, however, the symptoms again returned and this time he had retention of urine, necessitating catheterization. There followed five days of marked bladder difficulty, so that on the patient's return home

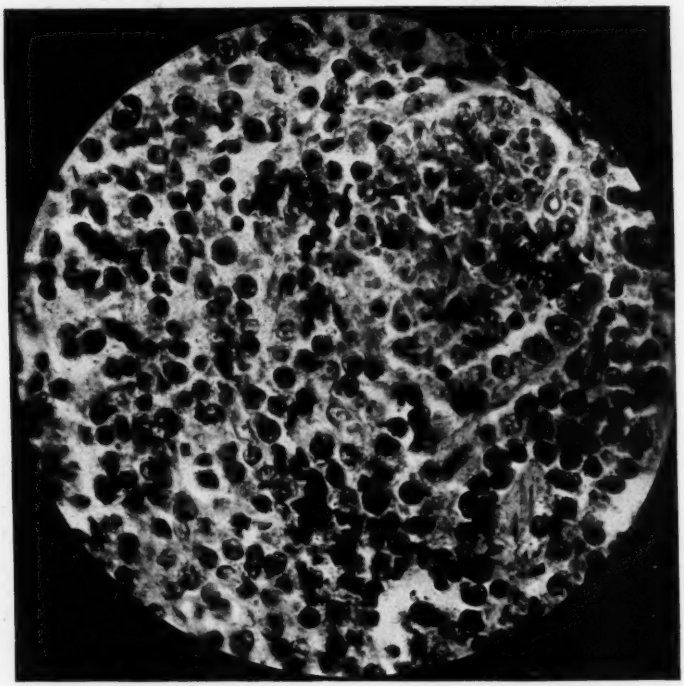


FIG. 1. LYMPHOID CELLS INVADING A NERVE FIBRE. NOTE FREQUENT MITOTIC FIGURE

early in January, urination was as frequent as every half hour during the day and on the 20th of January this had become so great that he was having much difficulty in passing his water at all. Following severe straining, blood was passed in clots. He was given irrigations of the bladder three or four times daily, and shortly after this he experienced an epididymitis on each side, lasting about one week. A few

weeks later, on rectal examination the prostate was said to be somewhat enlarged, and there was considerable pain in the rectum. The patient was cystoscoped and a diagnosis of tumor of the prostate made. On entrance to the Brigham Hospital, the patient's appearance was good, but it was evident that he had lost a moderate amount of flesh. The urine contained much pus and a considerable amount of blood. The blood pressure was normal and the general physical examination otherwise without special significance.

At cystoscopy on February 9, the following note was made:

The cystoscope entered the bladder without obstruction but caused considerable pain. The shaft had to be depressed definitely before the tip entered, thus suggesting some enlargement in the region of the prostatic urethra. Examination of the bladder was not satisfactory on account of the amount of pain caused by the instrument. It showed, however, only a mild degree of cystitis, especially localized in the region of the trigone; no stones or tumors, no diverticula. Examination of the bladder outlet showed a number of elevations very irregular both in size and shape, and bleeding on the slightest touch. These seemed to be in the beginning of the prostatic urethra, or certainly surrounding the internal meatus, and extending into the prostatic urethra as far as could be seen with the cystoscope. The nature of these elevations was obscure. They did not seem to be pedunculated and did not suggest polyps, therefore. They seemed to be tense and as has been noted, bled on the slightest touch, so that accurate observation was practically impossible.

Rectal examination made while the instrument was in the urethra did not show any special thickening of the prostate. Rectal examination with the patient standing showed a prostate the lower two-thirds of which at least seemed to be practically normal. On reaching higher than this, however, a mass was encountered bulging toward the rectum which the patient said was very tender to touch. This seemed to be larger on the right side than on the left. On emptying the bladder, this mass disappeared. Neither seminal vesicle could be felt.

The diagnosis in this case was somewhat obscure principally on account of the difficulty encountered on cystoscopy. The story suggested an infection of the prostate accompanied at one time by a downward spreading toward the epididymis. It was not possible however to exclude tumor, in as much as Dr. Normand of Fall River on cystoscopic examination, which may have been made under more favorable circumstances than was ours, felt sure that he had found such to be present.

Operation, February 14, 1918. With the patient in the high lithotomy position, the usual incision was made connecting the tuberosities of the ischium with the bulb. After section of the recto-urethralis muscle, the rectum was pushed back and the urethra at the tip of the prostate was exposed. Here the posterior layer of the fascia was incised and the posterior retractor put in place. The long prostatic tractor had been placed previously into the bladder. Examination of the prostate and of the seminal vesicles by this route failed to demonstrate any pathology demanding surgical intervention; that is, it had been thought possible that an undrained, infected seminal vesicle might be found, but this was not the case. The wound was therefore closed after uniting the levator muscle with one chromic cat-gut stitch. The patient was then placed in the dorsal position, Trendelenberg, and the bladder opened in the usual manner above the pubes. Exploration by this route showed no tumor in the bladder, but a very vascular, easily bleeding prostatic urethra, dilated to a size easily to admit the thumb, and containing a small mass of very friable character, giving the same impression as does the liver when pinched between the thumb and forefinger. It was not to be determined whether this condition in the urethral portion of the prostate was due to chronic infection with overgrowth of the mucosa, or was due to actual neoplasm. A small bit of tissue was excised for pathologic examination and the bladder closed by interrupted sutures in the usual manner around a large drainage tube.

Pathological report. Dr. S. B. Wolbach.

Material. Tissue from prostatic urethra.

Gross description. The specimen consists of a square fragment of tissue 1 cm. square and 3 mm. in thickness, with a smaller piece 4 mm. in diameter and 1 cm. long, attached to one of the sides. The tissue is resilient and brownish. It was fixed in Zenker's fluid.

Microscopic report. The tissue is composed of a compact mass of small round cells, the size and general appearance resembling the lymphoid cells found in the germinal centers of lymph nodes. In one part of the section there are bundles of smooth muscle fibers cut in cross section, completely surrounded by this tissue. The supporting tissue consists of a delicate reticular tissue with numerous small blood vessels and capillaries. There are numerous mitotic figures and the whole appearance can only be explained on the basis of a new growth, a lympho-blastoma.

Diagnosis. Lympho-blastoma.

In view of this pathologic diagnosis, the possibility of a total prostatectomy was considered but was thought contra-indicated because of

generalized metastasis as shown by the patient's very rapid loss of weight and appetite.

On March 10, the following note was made:

The patient has gone down hill rapidly during his stay at the hospital. It is now possible to palpate a very definite tumor mass above the pubes in the region anterior to the bladder. Also there is extension to the perineum by the growth making it painful for him to sit. Yesterday he complained of pain in the left eye and on examination it was found that he was suffering from double vision. This probably means a cerebral metastasis. All the urine since operation has been passed without pain from the suprapubic opening. He is discharged to his local doctor because he very much wishes to return home and having lost strength rapidly, he will soon be unable to travel.

A letter from his physician states that death occurred about three months after operation.

It is thus seen that the early clinical picture of lympho-blastoma of the prostate in this instance was essentially that of an acute infection, and that this condition overshadowed the tumor growth which locally was only of insignificant size and interpreted only with difficulty on cystoscopic examination. Following this insidious origin, the early course and general malignancy was so great that death occurred four months after onset of symptoms.

This is so unusual and striking a picture that it will be of interest to consider in this connection the reports of the other three cases of lympho-sarcoma found in the literature.

Case of Coupland. Lymphoma (lympho-sarcoma) of the prostate; secondary nodules in pancreas and supra-renal capsules.

The patient, a police constable of twenty-nine years, married, had had one attack of gonorrhea and of chancre. The onset of his illness was three months before admission, occurring as an attack of acute retention after a debauch. He was catheterized, placed in hot bath and given opium. For the next ten days, occasional catheterization was necessary. On only one occasion was this followed by slight bleeding. Following this the patient was treated, while still in the hospital, for spasmodic stricture. The urine was thick with stringy mucus. His symptoms steadily grew worse and his strength failed rapidly. The next examination showed him to be slightly emaciated and sallow and his symptoms wholly referable to the bladder. He had a constant

desire to urinate and only a few drops of urine were passed after great straining and pain across the abdomen. There was much pus in the urine with mucus and phosphates. He complained of pain at the end of the penis. It was necessary to depress the handle of an instrument in order to make it enter the bladder. This instrument found calculous material in the bladder. Examination by rectum was very painful. It showed an almost uniformly smooth enlargement of the prostate, not very tender and of firm consistence. Two weeks later, the patient had a rigor, with fever, and pain in the lumbar region. The only symptom on the part of the rectum was a rather obstinate diarrhoea.

Death occurred fifty-four days after admission.

At autopsy the body was found to be much emaciated. There was a nodule in the pancreas at the junction of its head and body, the size of a filbert. The right adrenal was twice its normal size and was the seat of new growth. There was a bilateral pyelonephritis of severe grade. There was no dilatation of the ureters. The wall of the bladder was one-half inch thick and its cavity, no larger than a walnut, contained opaque urine. The base of the bladder was occupied by a firm mass continuous with the prostate and projecting into the bladder just below the ureters. The neck of the bladder and prostatic urethra were surrounded by tumor. The upper extremity of the growth extended into the bladder and was irregular and polypoid. The right seminal vesicle was large and swollen, the left was imbedded entirely within the tumor. The testes and epididymes were normal. There was no evident enlargement or infiltration of any of the pelvic, lumbar or inguinal lymph nodes. The rectum was empty and was not involved by the growth except through compression. The thoracic organs were normal.

Microscopic examination of the tumor showed it to be composed of small round cells in a fine meshed reticulum.

Case of Kaufmann. The patient was a color worker, twenty-five years old. In spite of the fact that there was marked enlargement of the prostate demonstrable, no clinical symptoms were caused by this.

At autopsy the prostate was found to be the size of a small fist, and was of dense consistence. The bladder was small and contained a little turbid urine. The median portion of the prostate projected into the bladder and the neck of the bladder was moderately infiltrated by a soft tumor-mass which appeared in the region of the trigone as thickened folds. The beginning of the urethra and the veru montanum were also infiltrated. The ureters were quite patent and the lumen of the urethra only a very little narrowed.

Frontal section showed the prostate to be about 6 cm. wide and 4.5 cm. high. The only normal configuration of the gland to be found appeared in the region of the left lobe. Everywhere else the tissue was replaced by a granular, white tumor-mass, which was prolonged posteriorly, especially in the region of the right seminal vesicle. The tumor was continuous into the right lobe of the prostate without any sharp line of demarcation. The seminal vesicle was converted into a mass of new growth 4 by 3 cm. without any sharp line of demarcation. On section, the tumor was white with a few yellowish brown areas and irregular furrows. The area between the ampullae of the vasa was free from tumor. There were extensive metastases in the pleura, kidneys, pancreas, dura and lymph glands of the neck, as well as in the femur, tibia, and calvarium. In the pelvis there were no glands involved except one the size of a pea, situated outside and in front of the left seminal vesicle.

On microscopic examination, the tumor and metastases both showed lympho-sarcoma; this appearing as a network of fine fibrils enclosing small spaces filled with lymphoid cells, while here and there were cells somewhat larger with multiple nuclei.

Case of Conforti and Favento. The patient was a man of forty-five years, whose illness began with a sudden attack of acute retention of urine, there having been no previous disease of the genito-urinary system. At this time the urine was clear. Examination showed the prostate to be soft and slightly enlarged. One month later, there occurred another attack with fever, severe pain in the bladder and cloudy urine. At this time, the prostate was very large, soft and fluctuating. On examination a month later, the patient was found to be having complete retention, fever and pyuria. The prostatic tumor projected into the rectum but it did not fluctuate. Transvesical prostatectomy was attempted but the growth was found already to have infiltrated the urethra and bladder. After four months illness, the patient died.

At autopsy the tumor was found to be a lympho-sarcoma, primarily of the prostate, with infiltration of the bladder, urethra and left ureter. There had occurred marked local recurrence of the tumor and this was found to occupy almost the entire space of the small pelvis and to measure about 7 by 10 cm.

From this brief contribution to the subject, it is evident that this form of tumor is highly malignant and in its early stages,

frequently difficult to diagnose. It also seems to be characteristic of this type of growth that its local symptoms are either entirely lacking or only made prominent by an intercurrent infection of the gland. The absence of infection of the local and neighboring lymph nodes seems also to be a striking feature of this type of neoplasm. In view of these facts, it is indeed fortunate that such prostatic neoplasms as these are very rare, for it is only too evident that we have no means at present, not even radium, which is adequate to control a tumor growth of such insidious origin and rapid formation of metastases.

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[1] Read before the American Association of Genito-Urinary Surgeons, Atlantic City Meeting, June, 1919.

DISCUSSION

Dr. E. L. KEYES, Jr., New York: I have seen but one tumor that suggested sarcoma of the prostate. I venture to comment upon it briefly because of some of the questions brought up to my mind by the very interesting paper of the last speaker. This tumor had some of the characteristics mentioned by Dr. Quinby. The condition was obviously a tumorous infiltration around the neck of the bladder and caused retention of urine without making any enlargement in the prostate itself, or extension to the bladder wall. The patient, as I remember it, was a middle aged man. The tumor was removed in large part, and its base cauterized; the removal was incomplete, and the patient subsequently died. No autopsy was obtained. The material obtained at operation was examined by Dr. Ewing, who found the general type of the tumor sarcomatous, but a few nests of carcinoma cells amid this. He stated that he believed the tumor was one that grew from the urethral rather than the prostatic glandular tissue; and that, in spite of the prevailing character of sarcoma, it was a carcinoma. He further reported that it was the excessive malignancy and rapid proliferation of the cells that obliterates the more orderly alveolar arrangement and made the tumor suggest sarcoma. Inasmuch as the history of all these patients is short, inasmuch as they occurred in relatively young people, where malignancy is liable to be most malignant, and in view of this case, it seems possible that some of the cases that have been reported as sarcoma are actually rapidly growing carcinoma.

The diagnosis of sarcoma of the prostate is open to further doubt from another point of view. I know to my certain knowledge that one of the cases reported as a sarcoma of the prostate, in which case the diagnosis was made by the removal of a piece of human tissue during laparotomy, the prostate was normal and the tumor grew from a retained testicle.

Dr. FRANCIS R. HAGNER, Washington, D. C.: I would like to report two cases:

One case of sarcoma of the bladder, supposed to be a round cell sarcoma of the bladder, that died probably within three months after the operation.

The other case was diagnosed a sarcoma of the bladder wall, involving the prostate. This was removed. It has now been twelve years since the tumor was removed, and certainly it was not all removed, I am sure of that, and within three weeks after the removal of that growth that man had a return. It has been ten years; that man still has a suprapubic tube and is still passing tumor masses. I at first thought it might be syphilis. I have never seen the man since he left the hospital. His wife is a female doctor and she will not let any more doctors see the man. But I understand that he is still passing tumor masses out of his bladder, and is in good general health. This was not a pedunculated tumor: it was a sessile incapsulated growth attached to the bladder wall and prostate, not an infiltrating growth such as you see in carcinoma. I have never been able to satisfactorily explain this case.

I think when we look over our cases of prostatectomy and we consider the mortality, we sometimes get a little puffed up. I know we ran 79 cases of prostatectomy with one death, and then we lost two in a week in which we never had a chance to remove the prostate. We opened the bladders and they died before the time before a second operation. So I think sometimes when we see these statistics, a man will be lucky and he will get a certain run of cases and get them well, and then he will lose maybe two or three right in succession when he thinks he is not quite so good a surgeon.

Dr. Barringer spoke of the gauze and the rubber as regards the controlling of hemorrhage. Now, of course, the advantage of the rubber is that you can take it out without any pain to the patient and there is no danger of hemorrhage. I have never seen one of these cases have hemorrhage immediately after the removal of the bag but you sometimes do when you take gauze out; we all know that many times it is very painful to the patient

and they do occasionally have secondary hemorrhage when the gauze is removed. There is a certain group of cases, we have had three or four such cases, that have bled after we put the bag in, if you will watch those cases you will find after the prostate is removed, there is no attempt at contracture of the capsule. You may massage it, and it is just like an old flaccid uterus, not contracting at all.

We have used a small gauze pad with an opening in its centre that the traction tube of the bag passes through that absolutely stops the hemorrhage as soon as that is put in. We have made it a rule in the cases of relaxed capsules to use that little gauze handkerchief over the bag. The bag is removed at the end of twenty-four to forty-eight hours and no attempt is made to remove the little piece of gauze, which comes out readily the next day. Several gentlemen have asked me how we keep up the pull on these bags. There is a gentleman in the west, I cannot think just who it is now, has made a little wire arrangement to pull on the bag. That is a very good thing. But the only trouble is, if the patient is not watched carefully and he begins to move around in the bed much, it will drop down between his legs and the pressure—the pull on the tube is gone. We used that for a while but we really have gone back to a little Buck's extension which is attached to the patient's leg to keep up the pull.

Dr. JAMES A. GARDNER, Buffalo, N. Y.: In regard to pain in sarcoma of the prostate, I wish to cite a case in which I found sarcoma, but did not recognize it. Per rectum the mass was so large I could not get my finger by. The man came to us because of difficulty of bowel movement and frequent urination without pain. The tumor had come on within four or five months and had grown very rapidly. I took him down to see Dr. Young and he stated that it was the first sarcoma of the prostate he had seen and that he would not have believed it, unless he had examined it himself. Later at autopsy the specimen was sent to Baltimore.

I wish to congratulate Dr. Fuller on his paper and to emphasize the length of time between the two operations. I believe this to be one of the secrets why these patients who are so weak are able to pick up and withstand the prostatectomy. As we all know, we can insert a supra-pubic drain and allow the patient to return home for a few weeks or months if necessary, and these apparently impossible cases will improve so that they are perfectly safe operative risks. I do not believe in using a general anaesthetic for the first operation, because under local anesthesia there is no pain or shock. In our experience they do better with the local anesthesia primarily, and since doing the two step operation our record of 159 cases with but one death, is pretty good proof that a number of those frail, run-down, old men came through that would not otherwise. I feel that the Hagner bag is a great advantage and we are very fond of it. We have a larger proportion of epididymitis than the doctor reports. I do not consider that this proportion is serious, because there is rarely a formation of pus.

I should like to emphasize another point that Dr. Barringer brings out, the keeping of the wound dry. I think it most satisfactory to grease the wound well with lanolin and cover with a rubber dam that has an opening for the drainage tube to come through.

Dr. KEYES: Do you put that down to the bladder wall?

Dr. GARDNER: No, we cover the line of suture with lanolin and use a rubber dam about 12 inches square with a hole in the center the size of a drainage tube. This ointment and rubber sheds the water very well. I picked up this point from Dr. Squire—who after placing his gauze dressings around the tube folds first from below then from the sides and last from above, making a sort of envelope. The dressing is changed about every two hours and the wound being kept dry for four or five days, gives a chance for primary union to take place, so that the healing is much more rapid.

Dr. WILLIAM E. LOWER, Cleveland, Ohio: I should like to emphasize the point that the primary preparation of the patient is of the greatest importance in these prostatic cases. I still feel that there are many cases in which the same drainage can be established through an inlying catheter, if the patient can tolerate it, for the patient can get about, and by applying a little clamp to the catheter the bladder can be drained at regular intervals. Later, after the bladder has become more or less relieved of the great amount of distention, the catheter may be allowed to drain continuously.

In regard to the two step operation, there is one circumstance which makes it a bit difficult, especially when the interval between the primary and secondary stage is very long; viz. scar tissue forms and destroys the flexibility of tissue, thus often making it rather difficult to take out the gland. A great many of these cases I prefer to drain with an inlying catheter. I think the primary operation should be done under local anesthesia. It is simple to do, it does not require anything except local anesthesia, and it is absolutely devoid of any shock. On the other hand, there is great danger of shock if the case is submitted to any kind of inhalation anesthesia except nitrous oxid-oxygen. By the use of a suprapubic trocar, and the insertion of a catheter through its cannula, drainage can be established without any cutting whatsoever.

Dr. KEYES: Do you do that by preference?

Dr. LOWER: I prefer this method to the cutting.

Dr. JOHN R. CAULK, St. Louis, Mo.: I suppose we all have little differences in technique. I am strongly of the opinion that the one thing we should not do in a two-stage operation is an immediate suprapubic cystotomy. We should institute catheter drainage before hand. That has been the greatest help to us. The cases on which we have done immediate suprapubic cystotomy have always been the ones with which we have had trouble between the first two stages, and that is exactly what we

want to dodge. The greatest help in the world is to put in the catheter, get drainage, get release pressure, get a good blood pressure, get a good phthalein output and then do a suprapubic under local anesthesia; and there is practically no absorption. Whatever absorption you have then is the little absorption you get from your suprapubic wound. And certainly the suprapubic should be done under local, because it is much easier to do a suprapubic under local than it is under general anesthesia. When you have your bladder full, and release the pressure, the bladder elevates up to you, and you have very little peritoneal stripping to do. The second stage may be done as promptly as we get our walling off, provided the patient's condition warrants it. This is the main advantage of the two stage operation, since it releases engorgement around the orifice and produces lymphatic block to prevent absorption and infiltration. I see no excuse in the world to put a tube in the bladder after your second stage of operation; it is the very thing to my mind we ought not to do; you get pressure increased, it keeps the wound from healing as promptly as it would have if you just let it alone. You have a perfectly well walled-off bladder, you cannot miss it, you can put your hand right down into it, and the urine is going to get out. Dr. Gardner says he smears over the wound with lanolin, and has a rubber dam. I have never used the dam. I have used lanolin and vaseline; but we have better result with oxide or stearate of zinc. Smear them over. Keep them absolutely water tight and they heal up as promptly as they do the first time.

I think the Hagner bag is one of the greatest safeguards in suprapubic surgery. That is the chief reason I do some suprapubic operations. We get the drainage. There is one thing that he has not mentioned about his Hagner bag that I think you can get from it. and that you cannot get effectively with gauze; (in fact I think gauze militates against it) and that is that it presses the mucosa of the urethral side and of the vesical side, and approximates them to the tissues above and below, and produces a funnel of the bladder neck, and holds it there to protect it against the veil like contraction around the neck which

you will get in a certain number of cases, but which you will get least if you use a Hagner bag and keep it in.

The mortality in the two-stage operation is certainly low, and the operation possesses one great advantage that it is devoid of rectal complications.

Dr. J. D. BARNEY, Boston, Mass.: I would like to add my word of praise of Dr. Hagner's bag. We have used it at the hospital ever since the bag was introduced and had great luck with it. I do not recall any serious hemorrhage which has occurred after the bag was put in. We find no trouble in taking the bag out. We have used, to keep up the tension on the bag and keep it in place, a modification of an invention that Dr. Townsend described I think some years ago; we call it the bird cage; it is light wire and can be readily made by any clever person, with rather stiff piano wire, and a pair of pliers. What we have is quite an elegant invention. I am sorry I haven't a specimen here. It does not get displaced readily, in spite of the activity of a patient, and is really self retaining. It is very readily adjusted, and does away with the necessity of putting on a ham splint, or Buck's extension, or anything of that sort. I think Dr. Townsend ought to develop that and put it on the market.

Another use we have for the Hagner bag is in the performance of perineal prostatectomies. I have been rather fond of the perineal prostatectomy of late, and like others, I have had very little trouble indeed with hemorrhage. There have been two or three cases which bled furiously at the time, and which were not readily controlled by gauze. I found by putting in the Hagner bag upside down, so to speak, back end first into the bladder and then inflating it and pulling down, generally the bladder neck is compressed very efficiently and very promptly and the hemorrhage stops at once. The man will urinate around the bag perfectly easily during the time which it is inflated. At the end of six or eight hours, although I have left it in inflated for twenty-four hours, the air can be let out, and you can sit tight and await results. If there is no bleeding, you can take it out. If there

is bleeding you can re-inflate it and pull it down again. I find it very useful.

Dr. JAMES A. GARDNER, Buffalo, N. Y.: In speaking about the tension on the Hagner bag, I neglected to speak of a little modification that one of my assistants made to the apparatus. The modification permits the patient to turn in any direction, the tension still being kept up. Patients state that this method of applying the tension is much more comfortable than using adhesive plaster attached to the leg or with Buck's extension. I wish to again emphasize the first step instead of frequent catheterization. The majority of these patients may have a congested urethra which becomes so sensitive that catheterization often causes some bleeding. The cystotomy can be done with as little discomfort as a catheterization under these conditions. I have found we had a marked hemorrhage from time to time because of the congestion of the bladder following a cystotomy. If a one step prostatectomy had been performed, this hemorrhage would have been a serious complication.

Dr. JOHN T. GERAGHTY, Baltimore, Md.: We have had a great many cases of sarcoma that seem to arise outside of the prostate, and secondarily invade the prostate. I do not believe sarcomas of the pelvic tissues are common. We have had quite a number of retro vesical and perirectal sarcomas arising in the pelvic tissues, in the neighborhood of the prostate, and subsequently invading the prostate. Of course, some of them are so far advanced when you first see them that it is impossible to say what has been the point of origin. But I cannot remember any sarcoma of the prostate that was confined to the prostate. In most of the cases one could really quite readily determine that the most extensive growth was in the tissues outside, and the prostate was not completely involved, although in some cases it was.

Interesting to note in two of these cases in the last two or three years radium was employed, with very marked success. In two cases the tumor entirely disappeared and they are well now,

after about a period of two years. We had, of course, no tissue from those cases, so we do not know the exact nature of the tumor, but we presume, from the rapid response to the radium, that they probably were lympho-sarcomas.

Dr. WILLIAM F. BRAASCH, Rochester, Minn.: I wish to endorse the remarks of Dr. Geraghty with reference to the comparatively frequent occurrence of peri-prostatic tumor. In the course of routine examination we quite frequently find retro-peritoneal tumors, which evidently involved the prostatic area, either primarily or secondarily. The nature of these tumors is variable, usually true sarcoma, tuberculosis, inflammatory or syphilitic. Tuberculosis of the peri-prostatic area is very easily confused with sarcoma. A patient who recently came under our observation is illustrative of the condition. On rectal palpation he was found to have a large retro-peritoneal tumor involving the prostate and which appeared to be a sarcoma. The tumor, however, disappeared under tuberculin and general hygienic treatment in the course of a few months.

Dr. JAMES PEDERSEN, New York, N. Y.: The one case of undoubted sarcoma of the prostate I have seen, bears out Dr. Quinby's point, namely, that the local and general symptoms and the physical signs of these cases when first seen are those of acute prostatic infections. The case was admitted to the urological service of the Post Graduate Hospital with a tentative diagnosis of sarcoma. The pathological findings confirmed the diagnosis, and the subsequent course left no doubt. The case has already been reported in full by Dr. Squier who performed both the primary and secondary operations.

Dr. ARTHUR L. CHUTE, Boston, Mass.: I am sorry Dr. Caulk has gone, because one thing that he said I wish to take exception to.

It seems to me that the two ways of draining a bladder, with a suprapubic tube, and with an inlying catheter, are not comparable at all. I believe that in a considerable proportion of

cases you cannot begin to get the drainage with the inlying catheter that you can with the suprapubic tube; that in the dangerous class of cases, in the men who have a bladder that is overdistended with clear urine, of light specific gravity, one will lose more if one attempts to drain these people with a catheter than if one opens them up suprapubically and establishes adequate drainage with a tube.

Drainage by inlying catheter is bound to be more intermittent than that with the suprapubic tube. This is due to the misplacement of the catheter at times; at other times it is due to the fact that the catheter becomes plugged with mucus or sometimes with blood, or phosphate. This intermittance of drainage, I believe, is much more likely to infect a kidney than the constant drainage which takes place through a large suprapubic tube.

I believe further that it is essential that one use local anesthesia in opening these bladders rather than any form of inhalation anesthesia. It seems to me that this is of tremendous importance. These people, under the use of local anesthesia, hardly get any jar at all, much less than has occurred in the few in which I have used gas and oxygen; ether should never be used under these circumstances: its action on kidneys embarrassed by back pressure is too dangerous.

I do not feel that the output of only 5 per cent of phthalein is a definite contra-indication to operation if a man seems otherwise in good condition. I appreciate the value of Dr. Geraghty's work on the phthalein test, but it seems to me that we must not judge of a man's fitness for operation solely by the percentage of phthalein that he excretes. A patient who is excreting by 5 per cent of phthalein, but who has a clean tongue, is not distended, and who has no signs of digestive trouble, may usually be carried through a prostatectomy safely, especially if this is carried out under spinal anesthesia. I have had two or more patients who have gone through a prostatectomy safely with an output of phthalein of 5 per cent or less, and I should deplore any attempt to decide the question of operation on the output of phthalein. If an individual is in good general condition, he should not be denied the advantage of operation because he is excreting a small

amount of phthalein, nor on the other hand should one feel that he can safely relax any care because the patient has a large output of phthalein.

Dr. H. G. BUGBEE, New York, N. Y.: I think that it is very important, in first placing the drainage tube, as a preliminary step to suprapubic prostectomy, so securely in the bladder, and so tightly, that there is no leakage around the tube. This can be done easily by using a mushroom tube, and carefully placing sutures, one above and one below the tube in the bladder wall. If the tube is clamped and so placed, it is not difficult to take two or three days to complete emptying a bladder which has been overdistended, particularly the type of case Dr. Chute has just mentioned, in which there is a considerable amount of danger in completely emptying a bladder where a catheter has not previously been passed. It has been our habit to have just a small amount of urine drawn off, at regular intervals, say every two or three hours, and perhaps take two or three days to empty the bladder the first time.

Dr. HOMER G. FULLER, Washington, D. C.: I intended to go into the detailed advantages of the Hagner bag in controlling the hemorrhage, but Dr. Caulk has done this. With the detailed advantages of which he speaks I thoroughly agree. A small piece of gauze with an opening big enough for the tube of the bag to pass through is advantageous in more perfectly compressing the surface of the capsule.

In speaking, Dr. Keyes asked me if there is any time any trouble in removing the gauze. Dr. Hagner has spoken of the readiness with which this is removed, if it does not, by chance, as it has sometimes, come out with the removal of the bag, why, it will remain there two or three days later, and become saturated and loosened through the saturation of the urine, and then comes away very readily.

As Dr. Hagner spoke of the rubber dam, I might say we have used that for some time, and indeed it is a very definite advantage, when you consider the comfort of the patient. It makes all the

dressings much cleaner. After the removal of the bag, and the gauze, it has been our custom to carry on the suprapubic drainage either with a small 18 French catheter, placed in position, or with a similar sized elbow shaped siphon drainage tube.

Dr. B. S. BARRINGER, New York, N. Y.: We have had two cases of sarcoma of the prostate at the Memorial Hospital; one of these was the case Dr. Pedersen spoke of, which, I believe, Dr. Squier has already reported. The other was a very similar case. Both of them were cases in which retention had occurred in young men between, I believe, twenty and thirty, before the adenomatous age. In both of them the prostate was removed, and I think in both of them there was some suggestion, before the removal, that the patient might have a sarcoma. This proved out in the pathological examination of the removed prostate, and when they came to the Memorial Hospital they had so much sarcoma in them they were beyond any treatment at all, and they promptly died, I think both of them within three or four months after operation. We did not attempt to do much to them there, because they had so much sarcoma that it was beyond any treatment. I was very much interested to hear that Dr. Hagner has added gauze to his bag.

Dr. WILLIAM C. QUINBY, Boston, Mass.: I wish to emphasize once more what I am already on record as having felt about the control of hemorrhage after suprapubic prostatectomy. I have all the various forms of apparatus at hand, but have never yet had to use any of them. I fully believe the bag will practically never be necessary, if one is careful by getting a very wide exposure of the prostatic bed, to control the hemorrhage at the time of operation. Gauze certainly will not be necessary.

In regard to the question of lympho-sarcoma of the prostate, I can only say in, answer to Dr. Keyes' remarks, that these tumors are still under very active discussion by the pathologists, some calling such tumors carcinomata, others sarcomata. But this is a matter on which I really have no actual first-hand knowledge, so that it comes down to a question of the credibility of our respective pathologists.

In the case which I have reported I called attention to the pain with the idea that it was due to the infection—that is to the intercurrent infection of the gland. It was apparent, from the cases in the literature, that this type of tumor did not cause pain by nerve involvement, as do the carcinomata.

Several years ago I saw a case of peri-prostatic tumor such as Dr. Braasch described. But this case I have just reported was surely not of that sort, because we investigated the gentleman at operation from below, as well as from above. The only tumor present was in the prostate, with infiltration around the prostatic urethra.

URINARY TRACT PURPURA: A PROBABLE ENTITY[1]

A. RAYMOND STEVENS AND JOHN P. PETERS, JR.

In June, 1918, we published a preliminary report (1) of a group of cases that presented as a distinguishing feature a purpuric condition confined in at least the majority of cases to the urinary tract. The onset was acute; the course marked by temperature of an irregular type, general febrile symptoms, gross hematuria, frequency of urination and dysuria. The work has been continued, more material studied and more methods employed: The complete results of this study are incorporated in this report. Although the etiology of the condition has not been established, we feel that there is sufficient evidence to justify us in assuming that we are dealing with a new disease.

In 1916 Sir John Rose Bradford (2) noted the presence of a distinct hemorrhagic nephritis. His description of this type of case is so perfectly applicable to our own group of cases that we shall quote from it directly:

> In some instances, especially if the case is seen early, the urine may contain a large quantity of blood, so as to be obviously red to the eye. . . . . Such cases present a rather different clinical picture to the general run of cases, in that with them dropsy is neither so frequent, nor when present, so marked a feature of the case. Further, these hemorrhagic cases more frequently have pyrexia and resemble much more closely in their course infective nephritis dependent upon some microbic invasion. . . . . In a few instances the hematuria and pyrexia have been intermittent and recurrent, producing a clinical picture closely resembling that seen in renal embolism; but these patients have not been suffering from any condition liable to cause

[1] The work here reported was done while the writers were officers of the Medical Corps, United States Army, attached to Base Hospital No. 2 (organized by the Presbyterian Hospital of New York City), which had taken over No. 1 General Hospital, British Expeditionary Force, at Etretat, France.

Read at the meeting of the American Association of Genito-Urinary Surgeons, Atlantic City, N. J., June, 1919.

embolism. . . . . These cases, however, are few in number, and are quite different from the ordinary form of nephritis . . . . . where dropsy is really the dominant physical sign.

Dunn and McNee (3) have called attention to a similar group of cases. Unfortunately no distinction of clinical types is made in their discussion of pathology. We cannot claim an identity between our cases and theirs, but the similarity is suggestively striking.

Although this condition has been noted by these writers and others, they have failed to dissociate it from "war nephritis," and have greatly underestimated its frequency, if our statistics be accepted as an indication of the general incidence of renal conditions as they occurred on the British Western Front. The result of a clinical analysis of 204 consecutive cases admitted to the Hospital with a diagnosis of nephritis or with an allied condition is given in the following table.

	NUMBER OF CASES	PER CENT
Chronic renal or cardio-vascular disease	91	44.5
Acute nephritis	75	36.5
Albuminuria during infectious diseases	6	3.0
Pan-urinary pyogenic infections (demonstrated by ureteral catheterization and urine culture)	4	2.0
Urinary tract purpura	18	9.0
Questionable urinary tract purpura	10	5.0
Total	204	100.0

Furthermore the descriptions in the literature which we have found have failed to call attention to the lower urinary tract symptoms that are such a striking feature in these cases, and nowhere have we found any reports of examinations of the bladder.

We are reporting thirty-seven[2] cases encountered in a period of eighteen months in France. Of these thirty-six were seen while working with the British Expeditionary Force, and one with the American Expeditionary Force. Twenty-six conform

[2] The records of the first case are so incomplete that this protocol has been omitted.

in all respects to the picture of the condition under discussion. Two were atypical in their course, but exhibited the usual bladder hemorrhages. Nine, in which no hemorrhages were found, presented a very suggestive clinical picture.

It may seem surprising that a disease of such frequency should have passed unrecognized so long. The explanation seems to lie in the fact that all the cases were early placed in other categories because of one or another prominent symptom. Examination of the case reports will show that about half were admitted with a diagnosis of "nephritis." The others were labelled "renal" or "vesical calculus," "hematuria," "albuminuria," "inflammation of the bladder," "influenza," or "pyrexia of unknown origin." Without the aid of the cystoscope these errors might never have been corrected, although we were later able to make a preliminary diagnosis with reasonable certainty from the symptoms without this special aid.

Before beginning our duties in France we had decided to study closely so-called "war nephritis" and the allied conditions with the hope that we might dissociate one or more diseases that differed from the types known in civil practice. As a preliminary we instituted merely a careful clinical analysis of all cases admitted to the hospital suggestive in diagnosis or symptoms of renal disorders. Early in the course of the work we received a patient with profuse hematuria who complained of symptoms strongly suggesting vesical calculus or papilloma. Cystoscopic examination by one of us revealed neither stone nor neoplasm, but, instead, multiple submucous hemorrhages in the bladder wall and blood pouring from both ureters. The unusual findings in this case led to the routine use of the cystoscope in all cases of hematuria. The frequency of the condition and the constancy of the associated syndrome soon became apparent.

ANALYSIS OF CASES

For the sake of clearness the twenty-five definite cases with protocols will be discussed first, as a group, and the last eleven will be considered separately later, as possible variants of the disease.

HISTORY OF PREVIOUS ILLNESS

No suggestion of any predisposing factor can be found in the histories of these patients. Two (nos. 11 and 17) had had diphtheria; two (nos. 11 and 15) rheumatic fever; and three (nos. 3, 12 and 22), recurrent attacks of tonsillitis: all without cardiac or renal complications. Eight (nos. 3, 6, 8, 14, 15, 19, 23 and 24) had noticed exceptional dyspnea, but in only three (nos. 14, 19 and 23) was this sufficiently severe to prevent the patient from "carrying on," even on route marches, with a pack. Four (nos. 8, 9, 11, and 17) gave a history of recurrent respiratory infections and one of these (no. 17) showed signs of chronic bronchitis. Three only (nos. 2, 3 and 25) had had gonorrhea and these showed no residual signs of the disease.

PRODROMATA AND ONSET

In eighteen cases the onset was sudden with a complete development of the disease within forty-eight hours. In seven of these, urinary symptoms were preceded for from twelve to forty-eight hours by general symptoms: headache, pains in the legs, malaise, weakness and giddiness. Seven patients exhibited, for a variable period, symptoms that bore no definite relation to the typical disease complex. No. 3 had an acute onset of urinary symptoms after seven days of increasing weakness; no. 5 after a fortnight of intermittent headache, nausea and vomiting; nos. 22 and 24 after three days diarrhea and general malaise. Nos. 12, 14 and 17 had symptoms of respiratory infection for about a week. Even in these cases, the actual development of the disease was extremely rapid and these preliminary symptoms may have been merely adventitious and not true prodromata.

The complete picture of the condition at onset showed marked prostration and general malaise, headache, pains in the legs and back, gross hematuria, frequency and urgency of urination, dysuria and pyrexia. The order of appearance of the symptoms varied as did their relative severity.

ANALYSIS OF SYMPTOMS

Those patients who were admitted during the febrile period of the disease approached in general appearance the picture of an acute infection; later the most striking features were pallor and general debility. The common signs and symptoms of nephritis were noticeably lacking. Only four (nos. 7, 11, 15, and 16) showed any edema and, in these cases, it was very slight and evanescent. Only three (nos. 7, 8, and 12) suffered from dyspnea, and then only on exertion during the febrile stage of the disease. All were completely free from uremic manifestations, unless one place in this category occasional nausea and vomiting.

The pains were of two types: those that seemed to be due to the effects of a general infection, and those that were referable distinctly to the urinary tract. The former presented themselves as severe headache and general pains that seemed to have a tendency to localization especially in the back and limbs and were not unlike the pains of trench fever. These usually ended with the cessation of the first bout of fever, but showed occasional sporadic recurrences later in the course of the disease, usually associated with slight elevation of temperature. Tenderness or hyperesthesia was often present over the painful areas, but was not always constant.

The urinary pains varied from dull aching in the lumbar region and the upper abdomen to the acute, lancinating pain of renal or vesical colic, and were usually attended by marked tenderness over the kidneys and bladder. These pains may have been due to the passage of blood clots, which were noted in one instance (no. 10). A very large proportion of the cases suffered from severe dysuria and frequency and urgency of urination, which usually ceased shortly after the disappearance of the gross hematuria, but occasionally persisted longer. These symptoms may be due to the presence of the hemorrhagic lesions themselves, or to the presence of some irritating substance in the urine.

Dizziness and extreme muscular weakness were sufficiently frequent to deserve notice. Three patients (nos. 3, 7, and 17)

actually fainted. In the early stages, these symptoms might be looked upon as concomitants of the fever, later as indications of an anemia. Herpes labialis occurred in five cases (nos. 1, 7, 9, 20 and 21), and in one instance (no. 9) became infected. With these exceptions, the skin and visible mucous membranes were clear, except for the usual pediculosis and scratch marks. Cutaneous, oral and conjunctival hemorrhages were never found in spite of repeated examinations; nor did ophthalmoscopic examinations reveal any changes in the fundus. No abnormalities of the reflexes, sensations and muscular strength were found.

Signs of respiratory disease were discovered in only five cases, and, in these, bore no evident relation to the urinary condition. In two (nos. 12 and 14) respiratory symptoms definitely antedated the urinary symptoms in their development. The third (no. 17) had a chronic bronchitis.

Eight patients had abnormal cardiac signs. Nos. 4 and 22 showed a transient enlargement of the area of cardiac dulness to the left; nos. 9, 10, 12 and 21, systolic murmurs without enlargement; and nos. 5 and 16, slight enlargement with a systolic murmur. There were no disorders of cardiac action. The blood pressure was never elevated above normal limits, although n two cases the radial arteries were definitely palpable.

In three instances (nos. 1, 22 and 24) there was an initial diarrhea, and in a few others occasional nausea and vomiting. No gross blood was found in either stools or vomitus. Otherwise there were no disturbances of the gastro-intestinal tract. The spleen was found enlarged twice (nos. 9 and 20); in no. 9 this occurred in the presence of an intercurrent infection of herpes labialis. The liver was never found enlarged either by palpation or percussion, nor was jaundice ever present.

In eight cases there was tenderness in one or both renal regions: the right kidney was felt once. The external genitalia were uniformly normal. The prostate and seminal vesicles showed evidences of inflammation on rectal palpation in two cases only, and these had no pus in the urine

Only one patient no. 10) was afebrile throughout the course of the disease. In most cases the initial temperature was quite

high, in one instance 103.8° (by mouth) while under our observation. Of course our records are incomplete, because we have but scant notes on the initial period of the disease. The temperature fell rather rapidly in most cases, but in some remained elevated for a considerable time. After the cessation of this initial pyrexia, all the patients had occasional elevations of t mperature to 99° or 100° (by mouth) associated with general malaise and myalgic pains for an indefinite period. These temperature relapses were noted as late as the sixty-first day of the disease in one case. The pulse rate often remained elevated during the afebrile period. The temperature charts are appended with the case reports.

One case (no. 14) relapsed while under observation with a coincident recurrence of gross hematuria, dysuria and frequency, almost seven weeks after the onset of the illness. Another (no. 18), was admitted with an apparent recurrence after a free interval of seven weeks.

URINARY FINDINGS

All the patients exhibited gross hematuria in the early stages of the condition. This lasted from three to fourteen days. All but one (no. 10) showed casts at some time. Usually they were of the hyaline and granular types, but in at least seventeen cases cellular casts (epithelial and more frequently red blood cell casts) were present. Although gross blood did not persist very long, erythrocytes were observed as late as the sixty-third day of the disease in one case, and the fifty-ninth in another. Only occasionally was any considerable number of leucocytes seen, and never frank pus. Usually the appearance of leucocytes followed cystoscopic examination. Sometimes the urine became negative for a period, with a later recurrence of albumin and casts and red blood cells. In one instance (no. 14) there was a recurrence of gross hematuria while under observation. Albumin was seldom very marked; in most cases it could be fully explained by the amount of blood present.

No. 10 alone was discharged from the Hospital with consistently negative urinary findings and without symptoms. The majority

was evacuated to England, still showing a slight trace of albumin and casts; many showed microscopic blood persistently after the symptoms had disappeared. The termination of the period of observation varied from the eleventh day of the disease to the one hundred and eleventh. Although we have tried to follow these cases further by means of cards, we have received but few replies.

The only renal function test we were able to employ was the phenolsulphonphthalein test which was used in twenty cases. In all but four, there was a definite diminution in the excretion of the dye, the output varying from 13 per cent to 50 per cent in two hours. Where repeated tests were made, an improvement of function usually occurred with convalescence.

From the catheterized bladder urine of thirteen cases, staphylococci were obtained four times and a mixed growth of streptococci and Gram negative bacilli once; the other specimens were found sterile. Although the strictest precautions were observed, it is so notoriously difficult to obtain urine sterile, it seems safer to consider these as contaminations, especially as the organisms were seldom found in all the media used, and subsequent cultures from the same subjects proved negative when taken. The following media were used: broth, glucose-agar, hydrocele-glucose-agar and blood-agar. In six cases anaerobic cultures were also set up. In no cases were any organisms found in the smears of the urinary sediment, stained with methylene-blue and Gram.

Giemsa and Fontana stains failed to reveal the presence of spirochetes, and the injection of urine from three cases into guinea-pigs was equally unsuccessful.

EXAMINATION OF THE BLOOD

White blood cell and differential counts on ten patients showed so little uniformity that no conclusions can be drawn from them beyond the fact that there is, apparently, no leu ocytosis. Late in the disease a slight secondary anemia was found, coinciding with clinical observation. In no. 12 this was considerable, the hemoglobin being 60 per cent and the red blood cell count

2,720,000 on the tenth day. No morphological changes were observed in the cells except some central pallor of the red corpuscles. No nucleated red cells were found.

Blood cultures were made in eleven cases. Two of these showed a few colonies of cocci on single plates only. These were not obtained on subsequent cultures and were probably contaminations.

Conditions did not permit a study of the chemistry of the blood or urine.

CYSTOSCOPY AND ENDOSCOPY

We undertook cystoscopic examinations of the earlier cases as a diagnostic measure to determine the origin of unexplained hematuria, associated with symptoms referable to the lower urinary tract. Multiple, fresh hemorrhages in the bladder mucosa, unassociated with inflammation, tumor or stone, were observed; and in those cases presenting gross hematuria at the time of cystoscopy, bloody urine was seen coming from both ureteral orifices. It was this striking and novel picture that led to this study. The impressions recorded in the earlier publicaton (1) need but little alteration to accord with our larger experience with these cases. As in the preceding paragraphs the statistics concern only the first twenty-five of the thirty-six protocols attached.

The initial cystoscopies were done from three to nineteen days after the onset of the illness. In all, essentially the same picture was found: multiple small hemorrhages into the bladder mucosa, unaccompanied by ulceration, neoplasm or calculus. Two cases had congestion of the whole bladder wall; otherwise there was no sign of inflammation in any instance. The hemorrhages numbered from two to over a hundred, and ranged in size from petechial spots to 1 cm. in diameter. The shape was usually irregular, and particularly so when neighboring lesions became confluent. They occurred chiefly on the posterior and posterior lateral walls of the bladder, and in nine cases involved the trigone, more frequently the proximal half. In no case was a hemorrhagic spot seen adjoining the margin of a ureteral orifice. Small petechiae

were noted four times on the anterior wall, but in every case lesions were found at the same time on the posterior wall. Very commonly it was noted that the hemorrhages were adjacent to or interrupted the course of visible blood vessels.

When gross hematuria existed at the time of cystoscopy, blood was clearly seen to come from both ureteral orifices. At no time did we note blood oozing from the bladder mucosa or issuing from the posterior urethra.

A second bladder examination was made in six of the twenty-five cases considered. In three, signs of some of the old lesions were present twelve to thirteen days after the first cystoscopy, although partially cleared up. In the other three instances, no signs of the original hemorrhages could be found. These latter observations were made eight, ten and twenty days after the initial cystoscopies. Contrary to the statement made in the preliminary report, we can record the occurrence of new bladder hemorrhages late in the course of the disease (no. 14, possibly no. 10).

Urethroscopy was done five times, and a good view of the posterior urethra obtained in four cases. Three of these presented well-defined hemorrhagic spots, all on the verumontanum.

Although we have made the presence of bladder hemorrhages the *sine qua non* for a diagnosis of the condition we are describing, in view of the fact that the bladder evidences have occurred chiefly at the onset of the disease and that these hemorrhages are absorbed rather quickly, it seems probable that this disease is more common than our figures show. Moreover, it is possible that the kidney, pelvis and ureter may alone be affected in some cases.

PATHOLOGIC REPORTS

We were able, by means of a small punch, operated through the cystoscope, to obtain specimens from the hemorrhagic spots in seven cases. On section these showed nothing absolutely characteristic. The mucosa was normal and unbroken. Where the bleeding had been recent, a profuse and patchy infiltration of well preserved red blood cells appeared in the submucosa.

There was no leucocytic infiltration and nothing suggesting an inflammatory lesion. The blood vessels were usually somewhat engorged. In one specimen, small nodular accumulations of degenerating connective tissue cells and wandering cells were found in the vicinity of the small arterioles, and there was indication of the formation of a mural thrombus in one of these vessels.

Two specimens from patients with hemorrhages of longer standing presented degenerative changes in the connective tissue cells of the submucosa and thrombosis of some of the medium-sized vessels.

The specimens were not entirely satisfactory because of their small size and the distortion resulting from the punch. If, as seems possible, the hemorrhages were due to vascular lesions, these lesions might not be included in such small bits. Unfortunately we had no bladder rongeur at our disposal with which we could remove larger specimens. That the changes observed were not due to mechanical factors we determined by comparison with specimens of normal bladder mucosa obtained from cases cystoscoped for other conditions. The lesions differed from the hemorrhagic spots obtained from a bladder which was the seat of cystitis in the fact that the latter showed a marked leucocytic infiltration.

Thus far the last eleven cases have been omitted from the discussion, because they differed in certain respects from the others. In nos. 26 to 34 inclusive, no hemorrhages were found in the bladder wall. Two of these (nos. 26 and 27) unfortunately escaped cystoscopy so that the absence of the distinctive lesions in these instances is not proved. In other respects they approximate very closely the clinical picture above described. Of course these hemorrhages are as yet the only really distinctive feature of the condition, but it is more than conceivable that cases may occur in which no lesions are found lower in the urinary tract than the kidney and ureters, just as there are others in which the lesions extend down as far as the urethra. Some additional support for such a contention is found in the fact that

positive urinary findings were so frequently met in the first 25 cases even when the bladder wall was entirely clear. Moreover, in these instances, the cystoscopic examinations may have been made during intervals in which affected bladders were free from hemorrhages. If this is so, the incidence of the disease may well be higher than our figures show.

In no. 35 typical hemorrhages were discovered in the bladder. However, his clinical picture is very complex and there is evidence that the hemorrhagic condition was not confined to the urinary tract, but involved also the cerebrum. No. 36 conformed to type only at the very beginning of his illness, when his symptoms were entirely confined to the urinary tract. Later he developed a general purpuric condition that was rapidly fatal. At autopsy non-inflammatory hemorrhages were found in his bladder wall. As this is the sign on which we must depend for a diagnosis at present, we do not feel justified in omitting either of these patients. Furthermore, it may be that we are dealing with a hemorrhagic disease which usually reveals itself only in the urinary tract, but in severe cases, also affects other organs.

The changes observed in the kidney of no. 36 are not out of keeping with the urinary findings in the other cases. The hemorrhages into the mucosa of the renal pelvis and in the tubules of the kidney are the lesions one would expect in cases which so regularly present bladder hemorrhages, gross hematuria and red blood cell casts. This case is in itself sufficiently striking to merit publication and gains added interest from the fact that the microscopic picture of the kidney section resembles closely one among those recently reported by Tytler and Ryle (4). Further comparison is impossible because their paper contains no protocols.

DISCUSSION

The consistent presence of casts in the urine and the reduction of renal function indicated by the phenolsulphonphthalein excretion seems to be sufficient evidence to justify us in assuming the presence of a definite renal lesion in these cases. On the other hand the disease differs in very essential respects from the ordi-

nary types of acute nephritis seen in civil life or among the admissions of a General War Hospital. The common symptoms of edema and dyspnea are almost entirely lacking as are uremic manifestations. Moreover, although we have cystoscoped thirty patients who had typical nephritis with hematuria, none of them has shown bladder hemorrhages, the most striking feature in our cases. The comparative absence of pus cells in the urine, the absence of leucocytic infiltration about the bladder lesions, and the consistently negative bacteriologic findings argue against the common forms of urinary infection due to pyogenic organisms.

The temperature and associated symptoms give one the impression of a general toxemia, probably of infectious origin. Our inability to find the responsible organism may be due to any one of several factors. The organism may be unsusceptible to isolation by ordinary cultural methods. It may not appear in any of the fluids of the body available for culture, or may appear only during certain periods of the disease. Except for the first cases, we were unable to study any patients during the really acute stage; usually by the time they had reached us both the high temperature and the gross hematuria had ceased. Work at a hospital in the front area might have been more successful and might have offered more material for pathologic study.

In many respects the disease resembles trench fever in its general manifestations. The pains and tenderness are often strikingly similar in nature and localization. The temperature course, with its relapsing or intermittent character is quite indistinguishable at times. However, in the last analysis, the diagnosis of "trench fever" is one that must be made by exclusion only, at present; and any attempt to establish even a remote relation on the basis of such non-distinctive symptoms seems quite unwarranted.

The evidence that we are dealing with a clinical entity is merely circumstantial; but the appearance in a considerable number of cases, of a distinctive pathologic and clinical syndrome hitherto unreported, is hardly conceivable as a fortuitous series of coincidences. The bladder hemorrhages cannot, at present be dis-

tinguished from any other purpuric lesions; but a purpura of such frequent occurrence, which is apparently limited, in at least a large proportion of cases, to the urinary tract, is sufficiently extraordinary to command attention. (Among the total admissions to the hospital during a period of eighteen months, only two other cases of purpura were found. One of these was of the Schoenlein type; the other, in many respects resembled the fatal case here reported (no. 36) and may have belonged to our group as he exhibited profuse hematuria. Unfortunately he was admitted early in the course of our study and was not cystoscoped.)

If this report be accepted as a description of a new disease, it detaches "urinary tract purpura" from the loose aggregation of conditions known as "war nephritis," a name which should give way to one or more definite disease titles and "acute nephritis," —that irreducible minimum of unexplained renal disturbances known to all our civil hospitals in peace.

We can find no evidence to indicate that this disease is dependent for its occurrence on any specific war conditions. It has been observed in men from all branches of the Service. It developed in one of the members of our own organization who had never been within one hundred miles of the front area and whose contact with patients had been minimal because of his duties as dental technician. It seems quite possible that this purpura of the urinary tract may be encountered also in civil life and may explain some obscure cases of so-called "essential hematuria."

We desire to express our appreciation of the help we received from other members of the hospital staff—particularly to Colonel H. F. Swift for his constant interest and assistance; to Major A. M. Pappenheimer for interpretations of the pathologic specimens; and to Lieutenant D. P. Barr who aided greatly in the clinical work.

CONCLUSIONS

1. This paper reports a group of cases that presented as a distinguishing feature a purpuric condition confined, in at least the majority of cases, entirely to the urinary tract. This con-

dition was marked by an acute onset, temperature of an irregular type, general febrile symptoms, frequency of urination, dysuria, gross hematuria, cylindruria and a reduction of the phenolsulphonphthalein excretion.

2. The disease, as far as it could be observed, tended to run a prolonged subacute or chronic course. Occasionally acute relapses occurred.

3. In all, 26 definite cases and 11 questionable cases were found in a period of 18 months.

4. This condition made up 14 per cent of all the medical renal cases and 28 per cent of the acute medical renal cases admitted to the Hospital over a period of ten months.

5. The presence of the disease was established in both the American and the British Expeditionary Forces.

6. Pathologic examination of the lesions obtained from the bladder wall by means of a cystoscopic punch revealed submucous hemorrhages unaccompanied by any signs of inflammation. Suggestive vascular changes were observed in some specimens.

7. Bacteriologic examination of blood and urine proved negative. Attempts to determine the etiology of this condition or to identify it with any known disease were unsuccessful.

8. We believe the condition here described is sufficiently distinctive to merit consideration as a new disease.

9. There is no direct evidence that its incidence is dependent upon the special conditions occurring in war. It seems quite possible that cases of this disease may occur in civil life.

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(1) Peters and Stevens: Journ. Am. Med. Assn., 1918, lxx, no. 23, 1760.
(2) Bradford, Rose: Quart. Journ. Med., Oxford, 1916, ix, 125, and Journ. of the Royal Army Medical Corps, October, 1916.
(3) Dunn and McNee: Brit. Med. Journ., 1917, no. 2971, 745.
(4) Tytler and Ryle: Quart. Journ. Med., Oxford, 1918, xi, 113.

PLATE 1

FOUR CYSTOSCOPIC VIEWS OF HEMORRHAGES IN BLADDER MUCOSA, FROM THREE CASES

A

B

C

D

PLATE 2

Hemorrhages in Bladder Wall

Fig. A. Low power, showing patchy nature of hemorrhagic infiltrations. Case no. 15.

Fig. B. High power of similar lesion, showing absence of inflammatory reaction. Case no. 12.

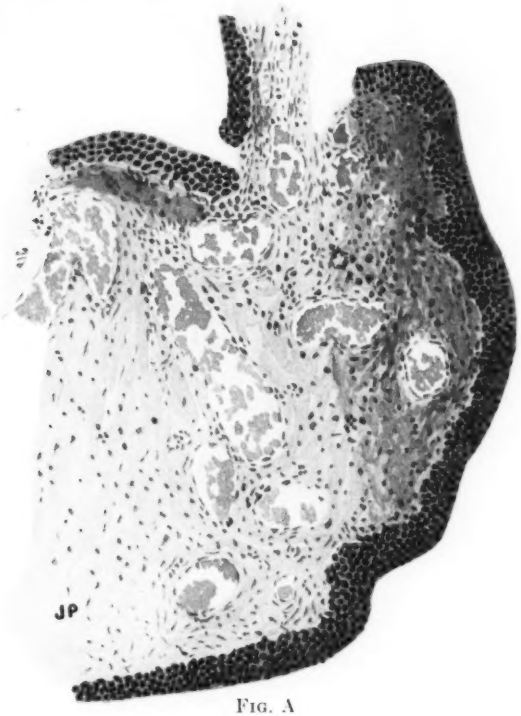

FIG. A

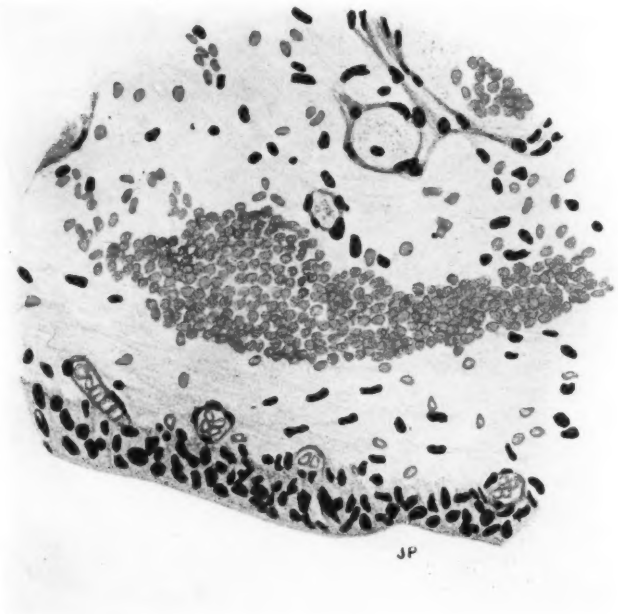

FIG. B

PLATE 3

OIL IMMERSION OF LESION IN SMALL ARTERIOLE IN A HEMORRHAGIC AREA.

CASE NO. 6

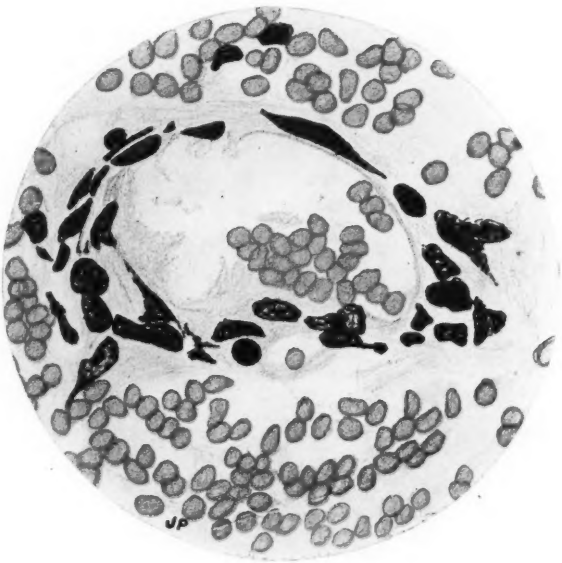
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PLATE 4

CASE NO. 14, FEBRUARY 5, 1918, SHOWING THROMBI IN THE MEDIUM-SIZED VESSELS AND CHANGES IN THE CONNECTIVE TISSUE OF THE SUBMUCOSA. HEMORRHAGES ALMOST COMPLETELY ABSORBED

FIG. A. Low power field, showing two thrombosed vessels.
FIG. B. High power field, including one thrombosed vessel.

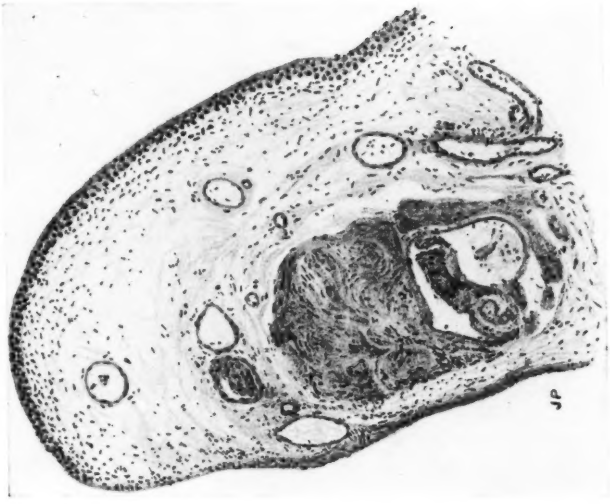


FIG. A

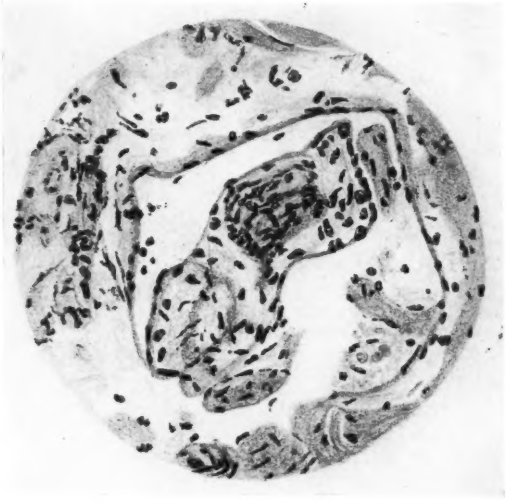


FIG. B

PLATES 5 AND 6

KIDNEY OF CASE NO. 26

FIG. A. Low power field, showing massive intratubular hemorrhages.
FIG. B. High power from same field.

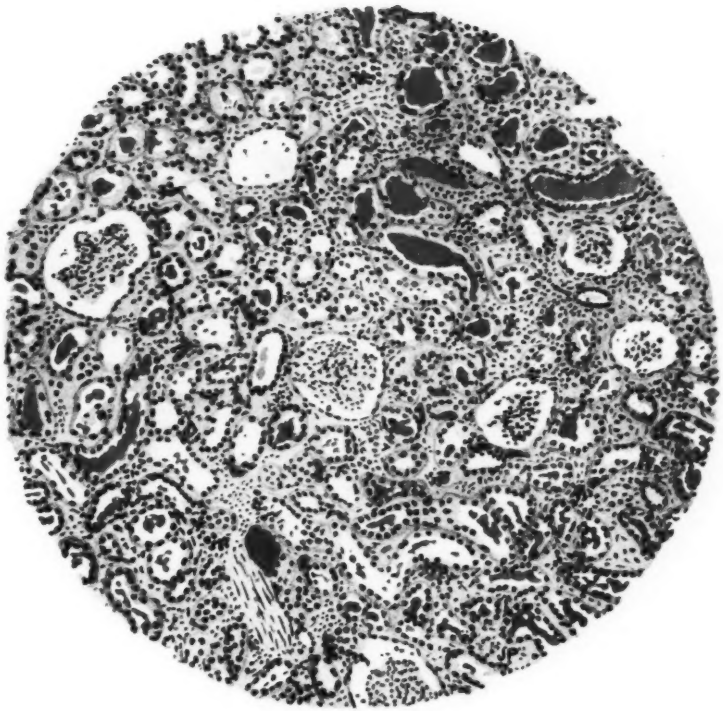


FIG. A

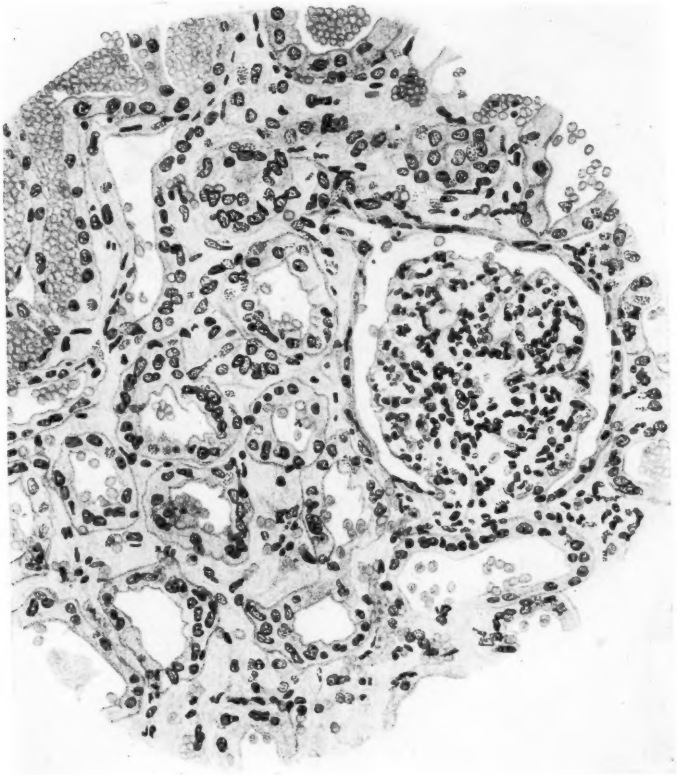


FIG. B

CASE REPORTS

Case I

Age twenty-six years. Infantryman. Total service three years. Field service six months.

Admitted: July 8, 1917.

Diagnosis on admission: Nephritis.

Past history:[3] The patient was a color mixer and worked with aniline dyes before he entered the Service.

Present illness: Began June 28, just after he had come out of the trenches, with headache, pains in the legs and general malaise. The next morning chilly sensations, diarrhea and temperature 103°. At the same time noticed that his urine was bloody. Bloody urine noted at Casualty Clearing Station on July 2. Diarrhea lasted only one day, but hematuria continued. July 1, pain on urination began. At no time did he have any shortness of breath or edema.

Physical examination on admission: The patient looked acutely ill, but seemed to be suffering no pain; was somewhat lethargic but perfectly clear mentally. No dyspnea or edema. No hemorrhages or other skin lesions, except herpes labialis. Teeth in very poor

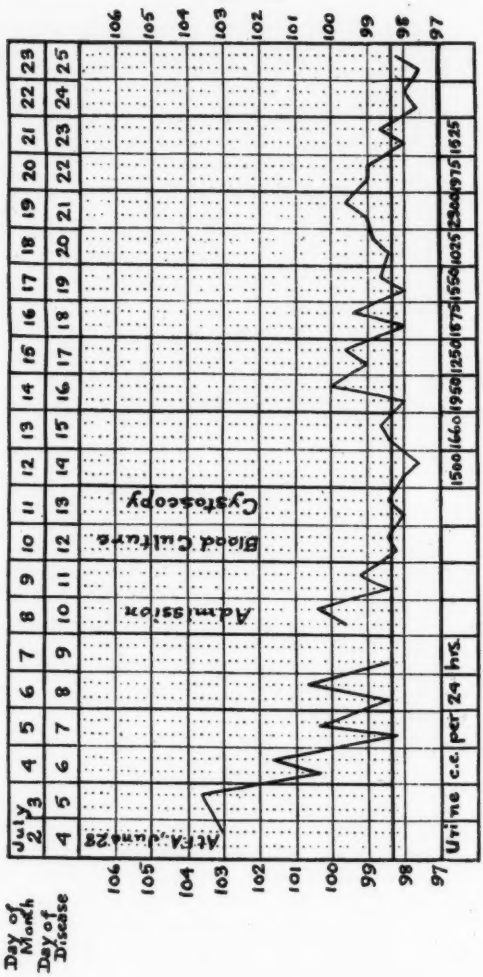
[3] In all histories, an attempt has been made to determine the presence of any conditions or diseases predisposing to cardiac or renal disease, previous diagnosis of heart or kidney affections and symptoms pointing to weakness of these organs. In all cases careful inquiries have been made for a history of scarlet fever, diphtheria, tonsillitis, rheumatism, dyspnea on exertion, orthopnea, palpitation, cardiac pain, edema, polyuria, nycturia, albuminuria and hematuria. The question of venereal diseases and addiction to alcohol has also been ascertained.

The previous occupation of the patient has been noted, as have previous rejections for the army. In the case of the latter an attempt has been made to determine whether the cause of the rejection was any cardiac or renal disorder. Finally we have enquired into the presence or absence of respiratory infection of any kind, at or immediately preceding the onset of the present illness.

In the study of the present condition, besides the regular chronological occurrence of symptoms, special questions have been asked with regard to the presence or absence of edema, dyspnea, orthopnea and other cardiac symptoms: headache, pains, syncope, coma, convulsions and other nervous symptoms; visual disturbances; chills and temperature; vomiting and diarrhea; oliguria, polyuria, frequency, nycturia, albuminuria, hematuria, dysuria and retention.

A systematic physical examination has been made in each case on admission and at intervals during the course of the disease.

For the sake of brevity, all negative findings will be omitted, except where, for the sake of emphasis, it seems advisable to report them.


Day of Month
Day of Disease
July
Afebrile 4 days
Admission
Blood Culture
Cystoscopy
Urine c.c. per 24 hrs.
1500 1660 1950 1250 1875 1550 1025 2300 975 1525

CASE 1

condition; pyorrhea and gingivitis. Heart: apex and left border of cardiac dulness in the nipple line in the 5th space; no enlargement to the right; sounds of good quality; no murmurs or accentuations. Pulse 90, regular. Blood pressure: systolic, 128; diastolic, 76. Lungs negative. Slight tenderness in both costo-vertebral angles and in the umbilical area. Spleen, liver and kidneys not felt.

July 9. Stool culture: No organisms of enteric group isolated.

*Urine reports:** Amount of urine excreted measured from July 12 to 21 and found normal, varying from 1500 to 2300 cc. in twenty-four hours.

DATE	SPECIFIC GRAVITY	ALBUMIN	R. B. C.	W. B. C.	CASTS
June 29.....		"Present"	"Blood present"		At Field Ambulance
July 2.....		"Heavy"	"Guaiac positive"		At Casualty Clearing Station
July 7.....	1012	++	+	+	0
July 11.....			+++	0	Cellular
July 30.....	1014	+	+	0	Few hyaline, many granular and occasional cellular

* For brevity, our analyses for albumin are reported as follows:

\+ = precipitate visible only with the aid of black background (heat and acetic acid test).

++ = precipitate just visible without black background.

+++ = precipitate opaque.

++++ = precipitate beginning to flocculate.

+++++ = precipitate solid.

Microscopic red and white blood cells are roughly quantitated in a similar manner. Gross blood is reported in terms descriptive of the appearance of the urine. In recording examinations of urine made elsewhere, the original terms are retained.

July 10. Blood culture—one colony of Gram positive diplococci.

July 11. Cystoscopic examination: Several small hemorrhages scattered over the posterior and lateral walls of the bladder and some congestion at the base of the bladder. Culture of urine obtained through the cystoscope—bladder urine shows few colonies of staphylococci (probably contaminations); urine from left ureter gives no growth. Right ureter not catheterized.

Ophthalmoscopic examination negative.

Blood count: W. B. C., 6100; polynuclears, 62 per cent; lymphocytes, 34 per cent; large mononuclears, 4 per cent.

July 12. Blood culture sterile.

July 20. Blood pressure: systolic, 128; diastolic, 84. Patient feels entirely well.

August 1. Phenolsulphonphthalein excretion 60 per cent in two hours and ten minutes from the time of subcutaneous injection.[4]

August 8. Patient evacuated to England, free from subjective symptoms. Temperature has been normal for some days. Last urine examination showed some albumin and casts.

Case II

Age twenty-nine years. Infantryman. Total service seven months. Field service four months.

Admitted: July 8, 1917.

Diagnosis on admission: "Stone in bladder (?)."

Past history: Gonorrhea six years ago; no complications. In civil life a boiler maker.

Present history: Onset sudden, June 30, while in trenches, with backache, frequency of urination, terminal dysuria, and hematuria that was also for the most part terminal. No shortness of breath or edema.

Physical examination on admission: Does not appear acutely ill. Mental condition normal. No dyspnea or edema. Heart entirely negative. Pulse 72, regular and of good quality. Lungs and abdomen negative. Liver, spleen and kidneys not felt. No tenderness in abdomen or back.

There is more blood in the second urine voided than in the first, in the two glass test. Culture of catheterized specimen of urine sterile.

Cystoscopic examination: On the posterior and lateral walls of the bladder are hemorrhagic spots; otherwise the bladder wall is normal. No stones or tumors. Ureteral orifices normal.

[4] We have, in all cases, followed a simplified technique for the determination of the phenolsulphonphthalein excretion. No attempt has been made to determine the exact time of appearance of the color in the urine. Two hours and ten minutes after the subcutaneous injection of the usual dose (6 mgm.) of the drug, the patient is directed to void, and the color is determined in this specimen. Patients have not been catheterized.

July 23. Frequency reduced to every four hours during the day, and patient does not have to get up to void at night. Phenolsulphonphthalein, 45 per cent.

(Temperature record lost.)

Urine examinations

DATE	SPECIFIC GRAVITY	ALBUMIN	R. B. C.	W. B. C.	CASTS
July 9.....	1020	+++	+++	+	Many hyaline and granular
July 10.....		+	++	+	Many hyaline and granular
July 21.....		0	0	0	

Case III

Age thirty-three. Infantryman. Total service eleven years. Field service two years and ten months.

Admitted: July 23, 1917.

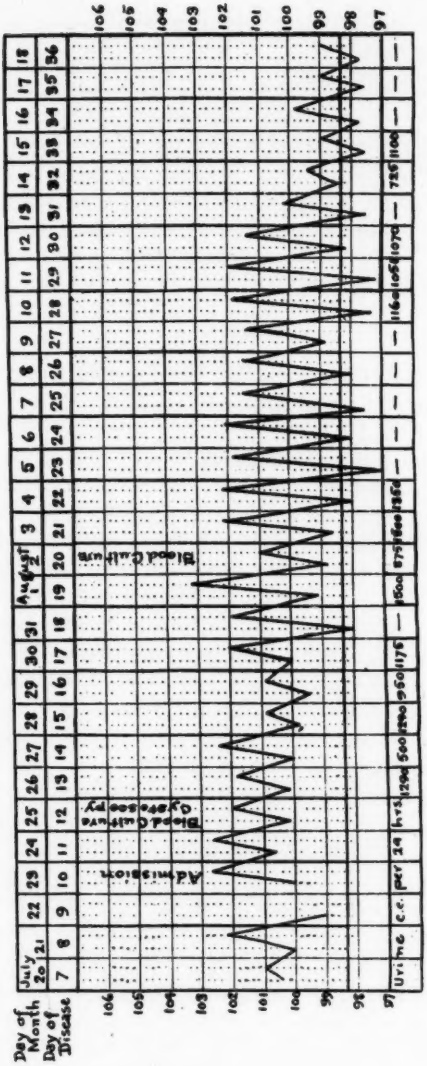
Diagnosis on admission: Hematuria.

Past history: Subject to frequent attacks of tonsillitis during the winter for years. For some time has suffered from shortness of breath when he carries his pack, and for the last two years has had to get up to urinate once every night. Has had gonorrhea, without complications.

Present illness: About July 14, noticed increasing weakness. July 20, while on duty, he fainted, and was admitted to the Field Ambulance. On recovering consciousness had severe headache and pains in the legs. He also noticed frequency of urination and dysuria. Field Ambulance reported profuse hematuria, and temperature 101°. Temperature and hematuria still present July 23.

Physical examination on admission: Appears acutely ill; somewhat stuporous, but mentally clear. No hyperpnea or edema. No signs of hemorrhages in the skin or visible mucous membranes. Lungs negative. Heart: apex beat felt 1 cm. to the left of the nipple line in the 5th space; left border of dulness lies in the same line; no enlargement to the right; sounds of good quality; no murmurs or accentuations. Pulse 90, regular and soft. Blood pressure: systolic, 124; diastolic, 76. Abdomen: tenderness in the upper part and in the right lumbar region.

July 25. Cystoscopic examination: Hemorrhages on the lateral and posterior walls, varying in size from minute points to 1 cm. in diameter,


Day of Month
Day of Disease
July
August
Urine
c.c.
Blood Cultures
Blood Oxygen Capacity
Albumin
106
105
104
103
102
101
100
99
98
97

CASE 3

and in color from bright red to deep brown. Both ureteral orifices normal and easily catheterized, 15 cm. Clear urine obtained from both kidneys.

Urine from both ureters shows very few granular casts, many red blood cells and epithelial cells, few leucocytes.

Cultures of urine from bladder and both ureters sterile.

No tenderness over kidneys; neither kidney palpable. External genitalia, prostate and seminal vesicles normal.

Phenolsulphonphthalein, 35 per cent.

Blood culture, sterile.

Blood count: W. B. C., 11,600; p.m.n., 52 per cent; lymphocyte, 42 per cent; large mononuclears, 2 per cent; transitionals, 4 per cent.

July 31. Steady clinical improvement. Today temperature normal for first time. Complains of sharp, sticking pain in region of cardiac

Urine examinations

DATE	SPECIFIC GRAVITY	ALBUMIN	R. B. C.	W. B. C.	CASTS
July 23	1025	++++	++	++	Present
July 30	1015	+++	+	++	Many granular
August 7		+	0	0	0
August 13			+	0	Many hyaline and granular
August 21		++	+	0	0
September 5		0	+	+	Many hyaline and granular
September 9		+	0	0	0

apex. Heart: not enlarged; left border 1 cm. inside left nipple line; no murmurs or accentuations. Lungs clear. Blood pressure: systolic, 118; diastolic, 76. Phenolsulphonphthalein, 40 per cent.

August 2. Blood culture sterile.

August 6. Still complains of some pain in the chest. No evidences of cardiac or pulmonary lesion.

August 7. Some pain and tenderness in left costo-vertebral angle.

Blood count: W. B. C., 8900; p.m.n., 39 per cent; lymphocytes, 50 per cent; large mononuclears, 1 per cent; transitionals, 9 per cent; basophiles, 1 per cent.

August 9. Blood smear shows no malarial organisms.

August 14. Complains of no symptoms except general malaise at night. Urine culture: diphtheroid and staphylococci (probably contaminations).

August 27. Complains of shooting pains in shoulders at night.

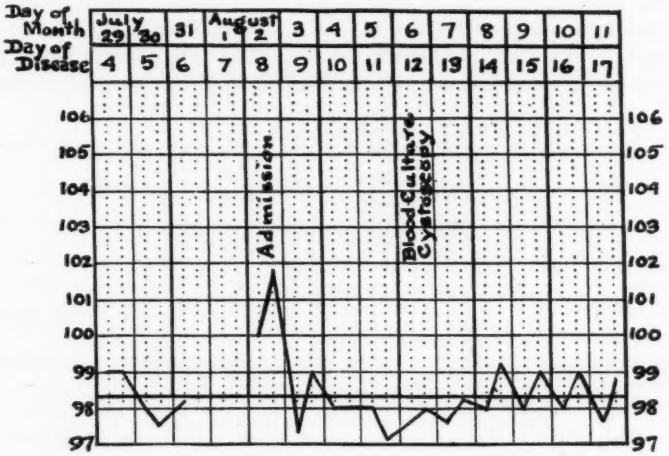
August 29. Feels perfectly well. Blood pressure: systolic, 124; diastolic, 84.

September 11. Phenolsulphonphthalein, 57 per cent.

Case IV

Age thirty years. Artilleryman. Total service twenty months. Field service ten months.

Admitted: August 2, 1917.



CASE 4

Diagnosis on admission: Hematuria.

Past history: Was a clerk before entering the service.

Present illness: Began July 26 with extreme weakness, headache, pains in the shins and the backs of the knees, fever and hematuria. No edema or shortness of breath. No frequency or dysuria.

Physical examination on admission: Appears acutely ill, but seems to be suffering no pain. No edema or hyperpnea. Is mentally clear. No visible hemorrhages in skin or mucous membranes. Lungs, abdomen and extremities entirely normal. Heart: apex beat in the 5th space in the nipple line; left border of cardiac dulness just outside the nipple line; no enlargement to the right; the sounds are of good quality;

no murmurs or accentuations. Pulse 78, regular, of good quality. Blood pressure: systolic, 126; diastolic, 58.

August 5. For three days has complained of pains in shins and shoulders, worse at night.

August 6. Cystoscopic examination: The whole surface of the bladder looks bright red and the vessels appear more prominent than normal. There is an aggregation of minute bright red spots on the right posterior wall, evidently clearing hemorrhages. Ureteral orifices normal. External genitalia, prostate and seminal vesicles normal.

Culture of urine sterile.

Blood culture shows a streptoccocus or pneumococcus producing green on blood plates, giving diffuse clouding in broth, doubtfully bile soluble, and not showing a definite capsule. This appeared in one flask only, another flask and all plates were sterile—(probably contamination).

Phenolsulphonphthalein, 55 per cent.

August 8. Allowed up. Feels entirely well.

August 10. Complains of some pains in shins again.

August 14. Feels entirely well; evacuated to England.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
August 2	++++	+	+	Present
August 6	+	++	0	0
August 7		+	0	Few hyaline and cellular
August 13	0	0	0	0
August 16	+	+	0	0

Case V

Age thirty-eight years. Machine Gun Corps. Total service twenty months. Field service four months.

Admitted: August 4, 1917.

Diagnosis on admission: Albuminuria.

Past history: Was an accountant in civil life.

Present illness: For two or three weeks before reporting ill was troubled with headache and nausea, and vomited every two or three days. On July 31 was suddenly seized with urgency and frequency of micturition, pain before, after and during urination. Reported sick and was taken to the Field Ambulance and from there to the Casualty

Clearing Station the same day. At the Field Ambulance, albumin in large quantity, but no blood, was found in the urine. At the Casualty Clearing Station blood was found in the urine. Has had no shortness of breadth or edema at any time.

Physical examination on admission: Still complains of urgency and pain on urination. Looks pale, but not actually ill, and seems to be suffering no pain. Mentally perfectly clear. No edema or hyperpnea. Lungs, abdomen and extremities entirely negative. Heart: apex beat in the 5th space, 1 cm. to the left of the nipple line; cardiac dulness extends from the right sternal margin to a point 2.5 cm. to

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
July 31.....	"Large quantity"	"No blood present"		
August 2.....	"Present"	"Present"		
August 4.....	++++	"Gross blood"	0	
August 6.....	++++	"Gross blood"	0	
August 13.....		+++	+++	Many granular and cellular
August 24.....		+++	+++	Many granular
August 25.....	++	++	+++	Granular and cellular
August 30.....	+	+++	+	Great many hyaline, granular and cellular
September 5....	+	+	+	Few granular, hyaline and cellular
September 9....	++	++	++	Many granular

the left of the nipple line in the 5th space; there is a faint systolic murmur at the apex, not transmitted. Pulse 72, regular, of good quality. Blood pressure: systolic, 122; diastolic, 86. No hemorrhages in skin or mucous membranes.

August 7. Pain less today, but frequency of urination has not diminished. Prostate boggy, but not especially tender. Seminal vesicles a little distended, but not indurated.

August 8. Cystoscopic examination: Distinctly bloody urine is seen coming from both ureters. There are many hemorrhagic patches, irregular in contour, scattered over the posterior and lateral walls of the bladder. Possibly slight congestion of the posterior wall, but

ureteral orifices are normal. The hemorrhages are not placed especially about the ureteral openings.

August 10. Pain on urination practically gone. Frequency continues; urination about every forty-five minutes; only small amounts are passed each time. Last night he had a slight attack of cardiac palpitation. The apex beat is heaving in character, 2.5 cm. beyond the left nipple line. No murmurs or accentuations. Pulse quite rapid. Phenolsulphonphthalein, 47 per cent.

August 14. Frequency continues, without pain. Catheterized urine shows profuse growth of staphylococci on blood plate; no growth on other media; no organism found in smears.

August 24. Now has to get up only once a night to urinate.

August 29. Symptoms entirely gone. Blood pressure: systolic, 126; diastolic, 84. Ophthalmoscopic examination negative.

September 10. Phenolsulphonphthalein, 48 per cent. Evacuated to England.

Temperature: No records before admission to hospital. Occasional elevations to 99° and 99.2° while in hospital.

Case VI

Age twenty-three years. Infantryman. Total service eighteen months. Field service six months.

Admitted: August 17, 1917.

Diagnosis on admission: Hematuria.

Past history: Some shortness of breath on long marches. Was a laborer in civil life.

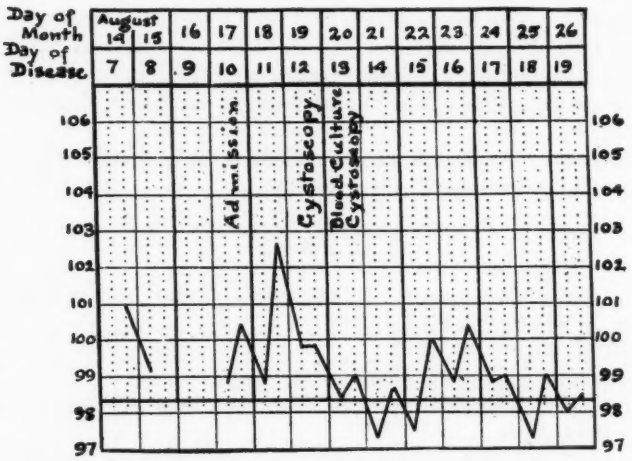
Present illness: Began August 11, six weeks after he had left the trenches, with headache, pains in the legs, hematuria, terminal dysuria and frequency of urination. He was forced to urinate as much as eight times each night at the beginning of his illness, passing only small amounts each time. No dyspnea or edema at any time. Was admitted to the Field Ambulance on the 14th, where a gross hematuria was reported, the blood being well mixed with the specimen. At that time also complained of severe headache and had a temperature of 101°.

Physical examination on admission: Does not appear acutely ill and seems to be suffering no pain. Somewhat pale. No edema or hyperpnea. The skin and mucous membranes clear, and present no signs of hemorrhages. Lungs and abdomen entirely negative. Liver,

spleen and kidneys not felt. No tenderness in back or legs. Heart: no enlargement, murmurs or accentuations. Pulse 78, regular and of good quality. Blood pressure: systolic, 110; diastolic, 74.

August 18. Phenolsulphonphthalein, 20 per cent.

August 19. Cystoscopic examination: The urine is slightly smoky. There are fresh hemorrhages scattered over the posterior wall and the posterior portion of lateral walls of the bladder. There is also one on the anterior wall. In some places these are seen to be composed of small fresh, almost punctate hemorrhages along the course of the vessels and interrupting the latter. In other cases there are big



CASE 6

splotchy hemorrhages with scattered small hemorrhages about them. There is entire freedom from congestion and no signs of inflammation about the hemorrhages. The ureteral orifices are not seen, but the region about their usual site is entirely normal. Several of the hemorrhagic spots are along the left border of the trigone, but the trigone is not affected more than the rest of the posterior and lateral walls of the bladder. External genitalia, prostate and seminal vesicles normal. Kidneys not felt; no tenderness about them.

Culture of urine sterile.

Today complains of severe pains in shins.

August 20. Cystoscopy: Three specimens of bladder mucosa removed through the cystoscope with a punch, for pathologic examination.

Blood count: W.B. C., 6100; p.m.n., 52 per cent; lymphocytes, 46 per cent; large mononuclears, 1 per cent; transitionals, 1 per cent.

Blood culture sterile.

August 28. Phenolsulphonphthalein, 40 per cent.

August 29. Blood pressure: systolic, 136; diastolic, 82. Ophthalmoscopic examination negative.

October 8. Complains of pain low down in lumbar region. Physical examination still entirely negative except for a continuation of the pallor noted on admission. Patient discharged, still showing positive findings in the urine.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
August 14.....	"Present"	"Gross blood"		At Field Ambulance
August 17.....	++++	++	+	Granular, hyaline and cellular
August 30.....	+	+	++	Many granular and hyaline. Epithelium
September 5....	+++	+	+	Granular casts and cylindroids
September 14...	++++	+	+	Occasional granular
October 2.....	++	+	0	Occasional granular
October 8.....	++	++	0	No casts. A few epithelial cells

Ophthalmoscopic examination entirely negative.

Pathologic report on sections from the bladder wall: Small fragments of bladder tissue excised with the bladder punch, fixed with Zenker and stained with Giemsa and with Wright stains.

Microscopic examination (by Captain Pappenheimer): The tissue is covered over for the most part by normal epithelium, showing numerous mitotic figures. The underlying tissue is infiltrated profusely with well preserved red blood cells and collagen fibrils, forced apart by edema. Deeper down the tissue is firm and a striking lesion presents itself in the form of small nodular cell accumulations situated in the vicinity of the small capillaries. One of these is especially distinct and shows, under the high power, the following picture:

There is a mass of distorted nuclei, some are drawn out into long wisps and are hyperchromatic, others small, deeply stained and apparently pigmented. These nuclei belong in part to degenerating connective tissue cells and in part to wandering cells, some small lymphocytes and others impossible to identify. There are one or two eosinophilic polynuclears and reddish granules, resembling eosinophilic granules, scattered among the degenerating nuclei. The nodule reaches the lining of the vessel and causes a rounded prominence over which the endothelial cells show a marked alteration, the nuclei being irregular and pyknotic, and the cytoplasm less distinct than that in the normal endothelial cells lining the rest of the vessel. In a Giemsa stain no definite organisms were seen, but there is a group of purplish staining granules, probably part of the cytoplasm of a mast cell. Gram stains also revealed no organisms.

Case VII

Age twenty-six years. Infantryman. Total service twenty months. Field service seven months.

Admitted: August 21, 1917.

Diagnosis on admission: Nephritis.

Past history: Was rejected for the army in 1915, but does not know why. Worked in munitions for two years before entering the army; before that was a hotel manager.

Present illness: Began on August 11, while he was in the trenches, with headache, pain in the back, terminal dysuria and frequency of urination. He voided urine as often as three times during the night, passing only small amounts each time. He also noticed slight swelling of the face and some dyspnea on exertion, and felt very weak. Fainted twice the first day. He has had no extension of the edema and has not fainted again. Albumin noted at Field Ambulance, August 12; at Casualty Clearing Station, August 18. Gross hematuria first appeared August 18. Pain in back and headache persisted until August 21.

Physical examination on admission: Does not appear acutely ill. Seems to be suffering no pain, but complains of frequency of urination and pain on micturition, mostly terminal. No hyperpnea or edema. Except for some herpes labialis the skin and mucous membranes are entirely clear. Lungs and abdomen entirely negative. Liver, spleen and kidneys not palpable. No tenderness in back or legs. Heart: the apex impulse is found in the 5th space in the nipple line; the area of cardiac dulness extends from the right border of the sternum in the

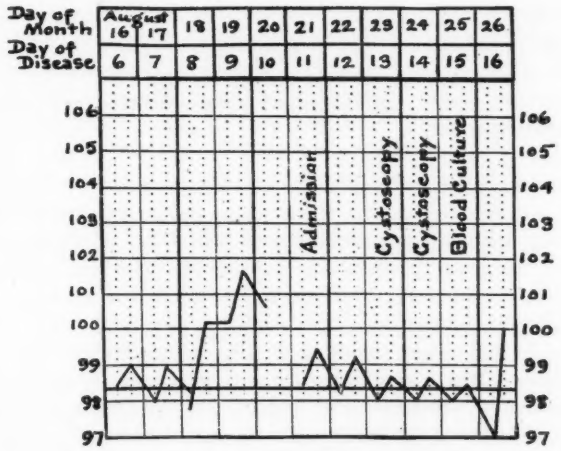
4th space to the left nipple line in the 5th space; no murmurs or accentuations; sounds of good quality. Pulse 84, regular. Blood pressure: systolic, 136; diastolic, 68.

August 23. Cystoscopic examination: Small, multiple, fresh hemorrhages appear along the vessels on both lateral walls of the bladder. There is one large hemorrhage on the posterior wall, just above the trigone.

The ureteral orifices and the trigone are normal.

External genitalia, prostate and seminal vesicles are normal.

Kidneys neither palpable nor tender.



CASE 7

August 24. Cystoscopy and removal of specimens from the bladder mucosa with punch.

Culture of urine shows profuse growth of staphylococci.

August 25. Blood culture sterile.

Blood count: W. B. C., 17,600; p.m.n. 76 per cent; lymphocytes, 24 per cent.

August 28. Phenolsulphonphthalein, 45 per cent. Patient found to be a meningococcus carrier and therefore transferred to another hospital. Did not develop meningitis.

Pathologic examination of sections from the bladder mucosa reveals no inflammatory lesion. The mucosa is normal. The underlying

tissue is slightly edematous and shows a profuse infiltration with well preserved red blood cells. No leucocytic infiltration. The vessels are somewhat dilated, but show no lesions.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
August 12.....	"Present"			From Casualty Clearing Station
August 21.....	++	+++	+++	Many granular
August 24.....		+++	+++	Many granular and cellular. Many epithelial cells

Case VIII

Age thirty-two years. Infantryman. Total service seven months. Field service four months.

Admitted: October 3, 1917.

Diagnosis on admission: Nephritis.

Past history: Had bronchitis three times before joining the army. For two years has had some shortness of breath on exertion, but has been able to "carry on." He was a machinist in civil life. In 1916 he was rejected for the army, but does not know the reason. Since coming to France, he has done heavy labor in the front area. Had a cough and cold just before the onset of the present illness.

Present illness: Began September 30, with general pains and malaise. On the same day he was seized with urgency and frequency of urination and pain in the end of his penis when he passed urine. He also had severe headache and pains in the back. Later he deve'oped some shortness of breath. No swelling of the face or extremities. Complained of some dizziness and blurring of vision.

Physical examination on admission: Appears acutely ill. Very pale. No hyperpnea or edema, but the face looks very pasty. No hemorrhages in the skin or mucous membranes. Lungs and abdomen entirely negative. Liver, spleen and kidneys not felt. Some tenderness in both costo-vertebral angles, and slight general abdominal tenderness, without resistance and with no palpable masses. Heart: apex beat neither visible nor palpable; the area of cardiac dulness extends from a point 2.5 cm. to the right of the sternum in the 4th space to the left nipple line in the 5th space; no murmurs or accentuations. Pulse 72, regular. Blood pressure: systolic, 132; diastolic, 98.

Ophthalmoscopic examination reveals a considerable degree of myopia but the fundus is entirely normal.

October 4. Still complains of abdominal pain. Severe constipation.

October 5. Cystoscopic examination: Five or six tiny hemorrhages along the course of the vessels on the right posterior wall of the bladder, and one on the left anterior wall. The rest of the bladder is entirely normal. The urine voided at the time of cystoscopy is clear.

External genitalia, prostate and seminal vesicles normal. The abdomen is held rather stiff. There is some tenderness in the region of the kidneys, but the kidneys cannot be felt.

October 8. Phenolsulphonphthalein, 35 per cent.

October 26. Does not seem to improve. Looks pale and chronically ill. Skin very pasty. Heart: rapid, but not enlarged; no murmurs or accentuations. Blood pressure: systolic, 136; diastolic, 96.

October 27. Phenolsulphonphthalein, 45 per cent.

November 5. Cystoscopic examination: Bladder mucosa entirely normal.

November 12. Patient discharged, without any real improvement in his condition.

Temperature: No record before admission to hospital. Temperature not above 99° while in hospital.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
October 11.....	+	+++	+	Many hyaline and granular. Epithelium
October 18.....	+	+++	+	Few hyaline
November 5....	+	+	+	Occasional granular. Epithelium

Case IX

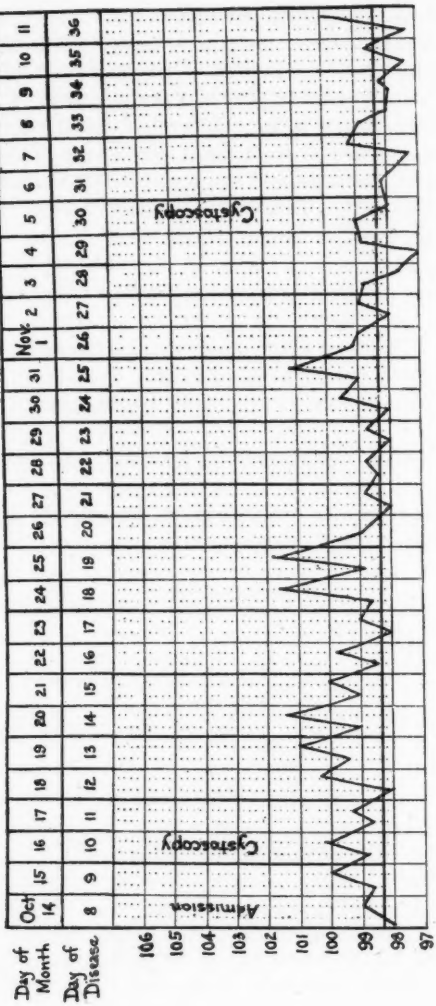
Age twenty-one years. Infantryman. Total service three years. Field service eleven months.

Admitted: October 14, 1917.

Diagnosis on admission: Nephritis.

Past history: Was a bookkeeper before the war.

Present illness: Began October 7 with giddiness. In the morning of the 8th he had general pains, and in the course of the day several attacks of chilliness without definite rigor. The next day the chilliness and general pains continued, and were associated with weakness and


Day of Month
Day of Disease
Oct 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 Nov 1 2 3 4 5 6 7 8 9 10 11
8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Admission
Cystoscopy
Cystoscopy
106 105 104 103 102 101 100 99 98 97

CASE 9

severe headache. Has had frequency of urination and hematuria since the onset but no dysuria or retention. Has improved under treatment. Since October 10 has developed sores on his upper lips and both nostrils. Now suffers only from pain in the right hypochondrium and slight headache.

Physical examination on admission: Looks acutely ill. Patient appears rather flushed. No hyperpnea or edema. There are crusted lesions covering both nostrils, herpetic in origin, and extending along the sides of the nose, the upper lip and the right corner of the mouth. Otherwise the skin is clear. Nowhere in the skin or mucous membranes are there any hemorrhagic lesions. Lungs and abdomen entirely negative. Liver and spleen and kidneys not felt. No areas of tenderness or masses. Heart: not enlarged; soft systolic murmur at the apex, heard also over the pulmonic area. Pulse 72, regular. Blood pressure: systolic, 130; diastolic, 82.

October 16. Cystoscopic examination: The bladder wall shows groups of blotchy hemorrhages along the vessels. Twenty independent spots appear on the posterior wall, high up on the lateral walls, and about the trigone.

External genitalia, prostate and seminal vesicles normal.

October 17. Ophthalmoscopic examination: retinae entirely normal; no hemorrhages.

Vomited this morning. Tenderness in left hypochondrium persists. Spleen definitely palpable.

October 20. Left side of upper lip shows several pustules at the base of the hair follicles, with considerable redness, induration and tenderness. Herpes evidently infected.

Phenolsulphonphthalein, 40 per cent.

October 26. Blood pressure: systolic, 112; diastolic, 76.

October 27. Phenolsulphonphthalein, 50 per cent.

October 29. The infected herpetic area has practically cleared up, after incision and drainage.

October 31. Still complains of pain in the left hypochondrium, and headache. Temperature elevated last night. Lip entirely well. Spleen not felt. Pulse rapid, regular and flapping. Heart: not enlarged; soft, systolic murmur, audible at apex; sounds are everywhere weak and valvular in character.

November 5. Cystoscopic examination: All the hemorrhages found at the last examination have disappeared and the bladder mucosa is entirely normal.

November 12. Patient has gained weight and strength, but still complains of general pains. Discharged to England.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
October 11.....	++	0	0	Hyaline and granular
October 16.....	+	++	0	Moderate number of granular
October 26.....	+	++	++	Cellular and granular
November 6.....	+	0	0	Hyaline and granular

Case X

Age twenty-nine years. Orderly to the dental specialist of this Unit. Total service five months. Field service four months.

Admitted: October 12, 1917.

Diagnosis on admission: Renal calculus.

Past history: Patient was born in Armenia but has spent the last few years of his life in the United States. He was a dental technician before he entered the Service.

Present illness: On the morning of October 12, he was suddenly seized with severe pain in the left lumbar region, not radiating. The pain was paroxysmal and intense. It continued throughout the day. After his admission to the hospital it changed somewhat in character, radiating forward into the abdomen. When seen he showed no physical signs except moderate tenderness localized in the left side of the back, just outside the outer border of the erector spinae, below the 12th rib. The heart was not enlarged, but there was a soft, systolic murmur at the apex. Lungs negative.

The urine showed many red blood cells and a few small clots.

October 13. Local pain, referable to the left kidney has subsided but patient complains of some general abdominal pain and terminal dysuria. The urine contains gross blood which seems to be passed largely in the last portion of the urine voided.

October 14. Urine examination negative microscopically.

October 15. Radiograms of kidney and bladder regions negative. Pain has completely ceased.

October 16. Pain in the side has ceased, but the dysuria still continues, associated with frequency of urination.

Cystoscopic examination: There are numerous hemorrhages over the posterior and lateral walls of the bladder. The ureteral orifices are

normal. Wax-tipped catheter passed 30 cm. up the left ureter, but no scratch marks obtained.

October 17. Frequency of urination, urgency and terminal dysuria continue. A small amount of blood is passed at the end of urination, with occasionally a small clot. Some constant suprapubic pain.

Blood culture sterile.

Blood count: W. B. C., 10,900; p.m.n., 57 per cent; lymphocytes, 39 per cent; large mononuclears, 2 per cent; transitionals, 2 per cent.

October 18. There is some tenderness in the bladder region.

October 19. Phenolsulphonphthalein, 55 per cent.

October 26. Pain in the legs last night. Some tenderness along the anterior surface of the left thigh. Some pain at intervals in the left

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
October 12.....	++	"Smoky and clots"	0	0
October 13.....		"Gross blood"		
October 14.....	++	0	0	0
October 17.....	+++	+++	0	0
October 18.....	++	+	+	0 (Urine in the morning red and smoky)
October 22.....	0	+	0	0
October 31.....	0	0	+	0
November 7....	0	0	0	0
November 9....	0	0	0	0

lumbar region and in the left hypochondrium, increased by deep breathing. Lungs negative. Heart: the apex impulse is in the nipple line; there is a soft systolic murmur at the apex. Blood pressure: systolic, 134; diastolic, 88.

Ophthalmoscopic examination negative.

October 28. Cystoscopic examination: Shows a persistence of the hemorrhages. There are some on the anterior wall on the left side, some on the posterior wall and along the borders of the trigone. None appears very fresh.

November 25. Gaining strength constantly. Has vague pains all over, but no definite symptoms. Urine normal. Discharged from the hospital.

Temperature: Records show no elevation above normal.

Case XI

Age thirty-five years. Infantryman. Total service one year. Field service four months.

Admitted: December 8, 1917.

Diagnosis on admission: Nephritis.

Past history: Diphtheria at age of nine. Rheumatism in 1900, no complications. Has had influenza twice.

Present illness: Began November 29 with shivering, hot flushes and general pains. He noticed that his urine was colored a chocolate brown. He had marked dysuria referred to the penis, and frequency of urination, passing only small amounts each time (had to get up as often as five times in the night). Was a little short of breath on exertion. The medical officer told him, when he reported sick, that he had some swelling of the legs. At that time he had a severe headache.

Physical examination on admission: Appears chronically ill. No hyperpnea or edema. Skin pasty. No hemorrhages found in the skin or mucous membranes. Lungs and abdomen negative. Heart: no enlargement; the sounds are very loud over the base of the sternum, but can hardly be heard at the left border of the heart; no murmurs or accentuations.

December 10. Cystoscopic examination: The bladder urine is perfectly clear. The bladder mucosa is entirely normal except for about 15 to 20 punctate hemorrhages along the lines of the vessels on the posterior and both lateral walls of the bladder. Ureteral orifices normal. External genitalia, prostate and seminal vesicles normal. The kidney regions are normal and the kidneys cannot be felt.

December 11. Blood pressure: systolic, 130; diastolic, 95.

December 13. Has had slight nausea and headache in the morning since admission. Hemoglobin, 90 per cent.

Phenolsulphonphthalein, 15 per cent.

December 15. Blood pressure: systolic, 120; diastolic, 85. Phenolsulphonphthalein, 15 per cent.

December 18. Cystoscopic examination: No signs of hemorrhages. One suspicious spot was seen on the posterior wall, but this was later removed with the cystoscopic punch, and proved to be not a hemorrhage but a small papillomatous hemangioma.

December 19. Phenolsulphonphthalein, 20 per cent.

January 9, 1918. Phenolsulphonphthalein, 30 per cent.

No symptoms.

February 4. Improvement in general condition has been continuous. Urine examinations have been entirely negative for a long time. Still looks pale and somewhat anemic.

February 16. Phenolsulphonphthalein, 55 per cent.

February 23. Blood count: Hemoglobin, 80 per cent; R.B.C., 4,750,000; W.B.C. 9,000; p.m.n. 44 per cent; lymphocytes 51 per cent; large mononuclears 1 per cent; transitionals 2 per cent; eosinophiles 2 per cent.

March 3. Phenolsulphonphthalein, 48 per cent.

March 4. Looks well nourished and developed but rather pale. Feels well except for slight cold. Heart: not enlarged; sounds of good quality; no murmurs or accentuations. Pulse 72, regular. Abdomen negative except for slight tenderness in right costo-vertebral angle. Blood pressure: systolic, 136; diastolic, 94.

March 5. Discharged to England.

March 19. Report from patient in England. Had been kept in bed, on a fish diet, since arrival in hospital in England. Repeated examinations of urine showed albumin constantly present.

Temperature: No records before admission to hospital. 99.8°, December 11, 99.6°, December 23; otherwise not above 99°.

Urine examinations

DATE	SPECIFIC GRAVITY	ALBUMIN	R. B. C.	W. B. C.	CASTS
December 8...		++	0	0	Few hyaline
December 11...		+	0	0	Few hyaline and granular
December 19...	1012	++	+++	0	Many hyaline, granular red blood cell casts
December 27...	1012	0	0	0	0
January 1.....		0	0	0	0
March 4.....		+	+	+	Hyaline
March 19.....	Albumin still present (report from England)				

Case XII

Age twenty-five years. Battalion medical officer. Total service two and a half years. Field service twenty-six months.

Admitted: January 3, 1918.

Diagnosis on admission: Acute nephritis.

Past history: Was formerly subject to rather frequent attacks of tonsillitis. Was quite well until the third week of December, 1917,

when he began to suffer with a cough. "Carried on" with the battalion in the line, however. After two days felt better. Then came out of the line and sent into tents. Felt perfectly well until morning of December 31.

Present illness: That morning noticed vague muscular pains in anterior surfaces of thighs and in calfs, not well localized and dull in character. Also had a slight headache and felt giddy, though he noticed no physical weakness. At this time had no urinary symptoms, and thinks he had no fever. The next morning when he passed urine, noticed severe, burning, urethral pain. From that time on was troubled with severe urgency and frequency of urination (passing very small amounts as frequently as every half hour), burning pain throughout the act of micturition and profuse hematuria. Felt very depressed and the giddiness of the day before continued. The headache was gone but he had a spasmodic cough. "Carried on" until 5 p.m. when he was forced to stop. At that time temperature was 102.4° and pulse 120. Was taken to Field Ambulance and from there directly to the Casualty Clearing Station. At 5 a.m. on January 2, temperature was 102°. Then complained of extreme thirst, although he was nauseated by the very sight of food, and had severe pain just to the right of the sternum, increased by deep breathing.

At no time did he have any pain in the back. The blood in the urine was always well mixed in the specimen, and grossly visible. The pain persisted throughout the act of micturition, but was unassociated with tenesmus. The urine showed gross blood up to the time of his admission to this hospital. The major part of the dysuria ceased the next day, and the frequency of urination diminished steadily.

Physical examination on admission: Appears anemic. Slight hyperpnea. No edema. Tongue red and inclined to dryness. Throat congested. Tonsils enlarged. Chest: expansion good; no areas of dulness; breath sounds over right upper anterior chest a little increased and rough; many fine, crackling râles brought out by coughing over this area, from just below the clavicle to the 4th rib. Heart: no enlargement; action somewhat rapid, but regular; no murmurs. Pulse regular in force and rhythm; arterial tension does not seem increased. Abdomen entirely negative. No costovertebral tenderness. Knee jerks normal. Tenderness present over the shins and in the left calf. Urine dark red.

January 6. Three sputum examinations for tubercle bacilli have been negative.

January 7. Predominant organism in sputum is a lanceolate diplococcus, probably pneumococcus.

January 8. Dysuria and hematuria have both ceased and frequency is much less marked. Last night voided three times. Cough also improved.

Physical examination: Looks chronically ill, but is suffering no pain. Slight productive cough with muco-purulent sputum. Skin and mucous membranes pale, but clear. Tonsils not enlarged or red. Pharynx rather granular in appearance. No enlargement of lymph nodes. Chest: respiratory movements normal and equal in rate and depth; over the whole right upper lobe some dulness, with harsh breathing, voice and whisper, and subcrepitant and mucous râles, not cleared by coughing. Heart: examination as on January 1, except for blowing, systolic murmur, maximum over 2d right interspace, heard also over 2d left interspace and at apex, but not transmitted to the left. Pulse 54, regular, of good quality. Arteries soft.

Blood pressure: systolic, 120; diastolic, 78.

Abdomen: liver and spleen not felt. No areas of tenderness or hyperesthesia anywhere.

Ophthalmoscopic examination: Entirely negative.

Cystoscopic examination: Bladder urine clear. Mucosa normal, except over distal half of trigone and along upper border of trigone, where there are several relatively fresh hemorrhages. There are also two small ones, one just at the outer side of each ureteral orifice; and a fading group higher up on the bladder wall, on the left side. Urine culture sterile.

Specimens of hemorrhages in bladder mucosa removed with punch.

Kidneys not palpable. External genitalia, prostate and seminal vesicles normal.

Blood count: R. B. C. 2,700,000; hemoglobin 60 per cent. W. B. C. 10,780; p. m. n. 83 per cent; lymphocytes 17 per cent.

January 11. Cough much less severe. Dulness and harsh breathing still persist over right upper lobe, but râles are less numerous. Dysuria now diminished to a little discomfort on urination. Appetite good. Phenolsulphonphthalein, 35 per cent.

January 12. Frequency still diminishing: voided only twice last night.

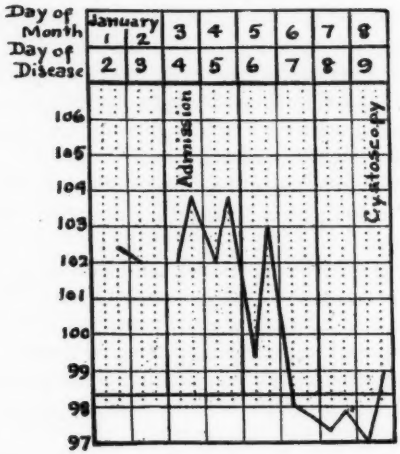
January 13. Cough almost gone. Chest signs clearing, no râles today.

January 15. Ophthalmoscopic examination still entirely negative. Patient now has to get up only once at night to urinate, and has practically no discomfort.

January 22. All signs in chest cleared up.

January 27. Discharged. Has been up and out for some time, much improved, with recovered strength. Lungs perfectly clear. Still has to get up once at night to urinate and is still conscious of very light discomfort in regions of bladder and urethra when he passes urine.

Phenolsulphonphthalein, 40 per cent.



CASE 12

Pathologic report of specimen of bladder mucosa (Capt. Pappenheimer): Sections show a small portion of bladder covered by a rather thin, but otherwise normal squamous epithelium. Underlying tissue edematous. Capillaries and venules dilated and engorged with blood. An irregular extravasation of blood into the loose cellular tissue. Inflammatory changes are found in none of the sections.

February 27. Report from patient in England: Urine, February 3, "negative quantitatively." Allowed up February 5. After going into town became very tired and short of breath. Pulse rate rose to 140, with precordial pain and uneasiness. No definite murmur and no pulse irregularity. Pulse remained irritable and cardiac symptoms continued for ten days, gradually improving with rest.

From that time on till date of note, has been fit except for recurrence of similar symptoms about once a week. Urine on four examinations during this period has shown no albumin, but always a few granular casts.

No temperature record obtained.

Urine examinations

DATE	SPECIFIC GRAVITY	ALBUMIN	R. B. C.	W. B. C.	CASTS
January 1.....			"Blood present"		From Casualty Clearing Station
January 4.....		+	0	0	Many
January 8.....		0	0	0	0
January 9.....		0	0	0	0
January 11.....	1010	0	0	0	0
January 15.....	1015	0	0	0	0
January 22.....		0	0	0	0
February 3.....		0	0	0	Report of patient from England
February 27....		0			Few granular casts constantly Report of patient from England

Case XIII

Age twenty-two years. Labor corps. Total service one year and six months. Field service ten months.

Admitted: February 3, 1918.

Diagnosis on admission: Pyrexia of unknown origin.

Past history: Occupation in civil life that of driver in colliery. In France has worked in the front area, but has never been in the trenches. Was placed in labor corps because of absence of left eye, due to traumatic injury in childhood.

Present illness: Began January 29, with headache and severe pains in the back. Was sent at once to Casualty Clearing Station. That evening noticed burning on urination and blood in his urine. No frequency or urgency. No dyspnea or edema.

Symptoms subsided rapidly in Casualty Clearing Station.

Physical examination on admission: Still complains of slight pain in the small of the back. Does not appear acutely ill, but is somewhat pale and thin. Left eye gone. Teeth in poor condition. Skin and

mucous membranes clear. No edema or hyperpnea. Lungs clear. Heart: Not enlarged; sounds of good quality; no murmurs or accentuations. Pulse 60, regular. Blood pressure; systolic 148; diastolic 80. Arteries soft. Abdomen negative except for slight tenderness in right hypochondium and right costovertebral angle.

February 5. Cystoscopic examination: Posterior wall and posterior parts of both lateral walls reveal many areas of relatively fresh hemorrhage in the bladder mucosa. These tend to be grouped and are mostly proximal to the trigone. Several small hemorrhages occur about, but not immediately adjacent to, the right ureteral orifice. Both ureteral opening are normal. Some groups are large and blotchy, while others seem to consist of aggregations of minute hemorrhages. Rest of bladder wall normal. No signs of inflammation anywhere. Two specimens removed with cystoscopic punch.

Catheterized specimen of urine (5 cc.) injected subcutaneously into male guinea pig. Pig killed after ten days. Autopsy revealed normal organs. Sections of liver, kidneys, bladder, lungs and other organs showed no organisms by Levaditi or ordinary stains. Culture of same specimen showed only contaminating staphylococci in one plate.

External genitalia, prostate and seminal vesicles normal. Kidneys not felt.

February 6. Ophthalmoscopic examination negative.

February 7. Complains of pains in left anterior chest. Heart and lungs negative.

February 8. Phenolsulphonphthalein, 40 per cent.

Blood culture sterile. Blood count: W.B.C. 9600; p.m.n. 57 per cent; lymphocytes 43 per cent.

February 9. Endoscopic examination. Instrument entered posterior urethra only with considerable pressure because of resistance of patient. One red spot found on right side of floor of posterior urethra, thought to be due to traumatism. Urethral mucosa otherwise normal.

February 11. Feels all right. Still looks somewhat pale and debilitated.

February 16. Phenolsulphonphthalein, 43 per cent.

February 18. Cystoscopic examination: Large area, diffusely red, composed apparently of almost completely faded hemorrhages, on right posterior wall, and smaller similar area on left side, nearer prostatic border. Remainder of mucosa seems entirely normal. Specimen removed with cystoscopic punch.

February 19. This morning pain in suprapubic region, right lower abdomen and right side of back. No pain on urination. Some tenderness in right lumbar region, both in front and behind, and some tenderness also in right iliac region. No masses felt.

February 22. Last night and today, pains shooting down right thigh and leg. Pains in back gone.

February 24. Blood count: W.B.C. 12,300; p.m.n. 61 per cent; lymphocytes 31 per cent; large mononuclears 5 per cent; transitionals 2 per cent; eosinophiles 1 per cent.

February 27. Phenolsulphonphthalein, 40 per cent.

March 4. Symptoms gone.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
February 4....	+++	+	0	Few red blood cell casts
February 5....	++	++	+	0
February 8....	+	+	++	Granular and cellular
February 11....	++	++	+	Few hyaline
February 19....	++	+++	++	Many hyaline and red blood cell casts
February 21....	++	+	+++	Hyaline, granular and cellular
February 22....		+	+++	Hyaline, granular and cellular
February 24....	+	+++	++	Hyaline and granular
February 25....	+	++	+++	0
February 26....	++	+++	++	Hyaline, some with red cells in them
March 5.....	+	+	++	Hyaline, and fine and coarse granular
March 11.....	+	++	++	Hyaline and red blood cell casts
March 12.....	+	++	++	Finely granular
March 17.....	+	+	0	Hyaline, coarse and fine granular
March 20.....	+	++	0	Coarse granular casts

March 12. Last night and today attacks of lancinating pain in left costovertebral angle. No tenderness.

March 17. Complains of nausea.

March 19. Still slight pain on urination; no frequency. Pains in back gone.

March 24. Blood count; R.B.C. 4,850,000; hemoglobin 80 per cent; W.B.C. 8100; p.m.n. 58 per cent; lymphocytes 35 per cent; transitionals 1 per cent; eosinophiles 5 per cent; basophiles 1 per cent.

March 25. Phenolsulphonphthalein, 30 per cent. Patient evacuated to England.

Pathologic report (by Capt. Pappenheimer): *February 5.* Fragment of bladder wall: The epithelium is practically intact over the fragment.

The sub-epithelial tissue, under the high power, shows vaguely the outlines of red corpuscles in the stroma, almost completely decolorized. Deeper down there is edema with deposition of a granular coagulum between the collagen fibriles. There are no inflammatory changes. One of the veins contains what is apparently a cell-fragment thrombus, consisting of a mass of pink material in which are embedded numerous irregular nuclear fragments with a few intact wandering cells.

Specimen of February 18 shows similar picture.

Temperature. 102° January 29; 99.8° January 30. No other record before admission to hospital. While in hospital, elevations between 99° and 100° up to the time of discharge.

Case XIV

Age nineteen years. Infantryman. Total service twelve months. Field service three months.

Admitted: February 3, 1918.

Diagnosis on admission: Nephritis.

Past history: Butcher in civil life. In 1916 sick three weeks with blood poisoning. Since coming to France thinks he has lost weight and has been troubled with some shortness of breath on route marches, which has forced him to fall out twice.

Present illness: Caught cold about January 21 (aphonia and cough). January 30 noticed blood in his urine and severe terminal dysuria. Had to get up two or three times a night to pass urine and suffered also with diurnal frequency. Passed usually small amounts at each voiding. No headache, edema, or dyspnea; some dizziness. No temperature recorded at Casualty Clearing Station. Has not felt feverish. Hematuria, dysuria and frequency continued until admission to this Hospital. Also had slight suprapubic pain.

Physical examination on admission: Appears acutely ill. Color good. Skin and mucosa clear. No edema or hypernea. Lungs: scattered râles over both sides of chest, more marked at right apex. Heart: not enlarged; sounds of good quality; no murmurs or accentuations. Pulse 60, regular. Blood pressure; systolic 122; diastolic 80. Arteries soft.

Abdomen negative except for moderate tenderness in suprapubic region and both costovertebral angles.

February 3. Blood count; R. B. C. 4,800,000; hemoglobin, 90 per cent; W.B.C. 6800; p.m.n. 64 per cent; lymphocytes 28 per cent; large mononuclears 7 per cent; eosinophiles 1 per cent.

February 5. Slight pain on urination.

Phenosulphonphthalein, 13 per cent.

Cystoscopic examination: Numerous groups of large hemorrhages, extending in horse-shoe form around posterior half of bladder, just above prostatic border. Some are nearly 1 cm. in diameter, often confluent and surrounded by minute hemorrhages. There are also a few small hemorrhages, along the border of the trigone. Remainder of bladder wall and ureteral orifices normal. No signs of inflammation about hemorrhages, or elsewhere. Two specimens removed with bladder punch.

Catheterized urine specimen (5 cc.) injected subcutaneously into male guinea-pig. After ten days, autopsy of pig revealed no pathologic lesions anywhere and no organisms were found in organs stained with Levaditi or ordinary stains.

Culture of urine sterile.

External genitalia, prostate and seminal vesicles normal. Kidneys not palpable; no tenderness.

February 7. Pain on urination has almost disappeared. No other symptoms.

February 8. Ophthalmoscopic examination negative.

February 9. Endoscopic examination: There is a small dark, blue, well defined hemorrhage on the top of the verumontanum, about 3 mm. in diameter. The remainder of the urethra is normal.

February 12. Blood pressure: systolic 132; diastolic 88.

Phenolsulphonphthalein, 17 per cent.

February 14. Blood pressure; systolic 142; diastolic 80. Blood count: W.B.C. 9000; p.m.n. 85 per cent; lymphocytes 9 per cent; transitionals 5 per cent; eosinophiles 1 per cent. Blood culture sterile.

February 18. Phenolsulphonphthalein, 27 per cent.

Cystoscopic examination: Group of 4 or 5 small hemorrhages on left wall, near prostatic border. One elongated, fading hemorrhage on right wall and one questionable one in the mid-line high up on the posterior wall. Rest of bladder mucosa normal. One specimen removed with bladder punch.

February 22. Phenolsulphonphthalein, 32 per cent.

February 28. Does not gain strength. Has slight headache and occasional dizziness. Phenolsulphonphthalein, 25 per cent.

March 4. Still complains of occasional headache.

March 6. Complains of toothache. Right lower jaw and submaxillary lymph nodes swollen and tender. Four decayed molar stumps removed and abscess drained.

March 9. Swelling of jaw and adjacent lymph nodes practically disappeared.

March 12. Phenolsulphonphthalein, 48 per cent.

March 17. Complains of dysuria. No frequency. Urine bloody.

March 18. Still has dysuria. Urine no longer grossly bloody, but appears smoky.

March 23. Cystoscopic examination: On posterior part of left wall, less than a centimeter from the prostatic border is an elevated, irregular, dark red nodule, giving the impression of a superficial hemorrhage elevating the mucosa. Just above this is a tiny flat hemorrhage in the line of a small vessel. A similar one is seen on the right side of the trigone. Remainder of bladder wall and ureteral orifices normal. Larger hemorrhage removed with punch.

March 25. Phenolsulphonphthalein, 55 per cent.

March 29. Complains of some nausea and giddiness today. Slight frequency and dysuria.

April 2. Last night and this morning vomited several times. Complains of headache and very slight terminal dysuria. Patient evacuated to England.

Pathologic report: (by Captain Pappenheimer):

February 5. Section consists of a 2 mm. sized fragment of bladder wall, covered on three sides by intact epithelium. Here and there this is being penetrated by a few mononuclear wandering cells. The submucous tissue is edematous. The nuclei of the connective tissue cells are curiously distorted and in some areas there is marked karyorrhexis. Some of the small arterioles contain pink-staining thrombotic masses, in which are embedded a few nuclear fragments. These can be followed through a number of sections. There are many wide endothelial-lined spaces, possibly dilated lymphatics. Some of these show a loose round-celled infiltration about them. One of the largest arteries in the section contains what is apparently a plug of organized tissue, overgrown by endothelium. In certain sections there is definite hemorrhage (with broken down red blood cells) into the loose cellular tissue, extending in some places to the epithelium.

February 18. Small fragment of bladder wall: the epithelium over one portion of the fragment is reduced to a single flattened layer of cells. The subjacent tissue is the seat of a fairly recent hemorrhage. There is a considerable amount of hemosiderin, both extra- and intracellular. There is edema in the remaining portion of the stroma. There are no large arterioles in the section.

March 23. Small fragments of bladder wall: the epithelium is desquamated over a portion of the fragment, probably an artifact. There are traces of an old hemorrhage in the connective tissue. The ghosts of the corpuscles are still to be seen and there is an abundance of hemosiderin pigment, chiefly extracellular. The nuclei of the connective tissue cells are much distorted and pyknotic. No inflammatory changes nor vascular lesions.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
February 4....	+++	++	++	0
February 5....	++	++	+	Cellular and hyaline
February 14....	++	"Smoky"	0	Many red blood cell casts
February 24....	++	++	++	Hyaline and cellular
February 26....	+	+	+	Hyaline, granular and red blood cell casts
February 27....	++	+	0	Hyaline casts filled with red blood cells
March 5.....	+	+	+	Finely granular and cellular
March 11.....	+	+++	0	Hyaline and red blood cell casts
March 17.....	++++	++	0	Granular, hyaline and red blood casts
March 18.....		"Smoky"		
March 20.....	+++	+++	+++	Hyaline and red blood cell casts
April 2.....	+++	++	++	Many hyaline and coarse and fine granular

Temperature: No records before admission to Hospital. While in hopital occasional elevations of 100° or 101° No rise with recurrence of symptoms and bladder hemorrhages on March 17.

Case XV

Age thirty years. Labor corps. Total service three and one half years. Field servce five months.

Admitted: February 17, 1918.

Diagnosis on admission: Acute nephritis.

Past history: Rheumatic fever in 1915, when on the Mediterranean front (symptoms pain, without swelling, in all his joints). Was in the hospital from this and "shell shock" from December 1915, to September 1916. At the end of that time was "boarded" and sent into a labor company. Has had slight shortness of breath on exertion since childhood.

Present illness: Began February 6, with frequency of urination (passing only small amounts at each voiding). Voided about ten times during the day and four times at night.

In the morning of February 8 was seized with severe headache and giddiness. In the afternoon noticed that his urine was bright red, and had initial dysuria. Frequency continued unchanged. Reported sick the next day and was put on light duty.

February 11. Sent to Casualty Clearing Station where he was found to have blood and albumin in his urine and puffiness of the face, but no oliguria. On admission to this hospital frequency diminished, but he still has to get up three times at night. Gross hematuria stopped on the 15th. Says he has had sharp attacks of pain in both sides of the back at intervals since onset.

Physical examination on admission: Appears chronically ill and pale. Rather poorly developed. Skin pasty; no edema or hemorrhages. Heart: not enlarged; sounds of good quality; no murmurs or accentuations. Pulse 72, regular. Blood pressure: systolic, 148; diastolic, 80. Lungs and abdomen negative. No tenderness in loins.

February 18. Phenolsulphonphthalein, 44 per cent.

Ophthalmoscopic examination negative.

Cystoscopic examination: Two hemorrhages about the right ureteral orifice and a small group posterior and median to these. Remainder of bladder wall normal. Specimen removed with punch.

External genitalia, prostate and seminal vesicles normal.

Catheterized specimen of urine cultured: no growth; 4 cc. injected subcutaneously into male guinea-pig. Pig returned to stock March 8, was under observation and without symptoms May 24.

February 27. Endoscopic examination: Only imperfect view obtained because of small size of urethra, but no urethral lesions discovered.

March 5. Blood count: Hemoglobin 77 per cent; R.B.C 4,770,000; W.B.C. 7700; p.m.n. 58 per cent; lymphocytes 39 per cent; eosinophiles 3 per cent. Slight poikilocytosis and central pallor of red cells.

March 9. Still has to get up once every night to urinate. Pallor and pasty look and general debility continue.

March 12. Phenolsulphonphthalein, 35 per cent.

March 19. Nycturia continues unchanged. No pains. No dysuria.

March 24. Blood count: Hemoglobin, 75 per cent; R. B. C., 4,500,000; W. B. C., 6000; p.m.n., 46 per cent; lymphocytes, 49 per cent; eosinophiles, 4 per cent; basophiles, 1 per cent.

March 25. Phenolsulphonphthalein, 40 per cent.

Patient evacuated to England.

Pathologic report (by Captain Pappenheimer):

February 18. Small fragment of bladder mucosa: epithelium is continuous over the entire fragment, except over a small pedicle-like tongue of connective tissue. There is extreme dilatation of all capillaries, with a recent hemorrhage into the subepithelial tissue. No inflammatory changes or vascular lesions.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
February 11....	"Small quantity"	"Blood present"		Report from Casualty Clearing Station
February 13....	"Trace"	"Tinge"		Report from Casualty Clearing Station
February 14....	"Trace"	"Blood gone"		Report from Casualty Clearing Station
February 18....	++	++	+	Occasional hyaline
February 21....	++	+++	++	Hyaline, granular and red blood cell casts
February 24....	+	+	+	Hyaline and red blood cell casts
February 25....	++	+++	+	Hyaline
March 5.....	+	+	0	Finely granular and hyaline
March 11.....	+	+	++	Hyaline, finely granular and cellular
March 20.....	+	+	+	Hyaline and finely granular

Temperature: No records before admission to hospital. Irregular temperature of 100° to 101° until February 25. After this occasional rises to 99° or 100° until March 18.

Case XVI

Age twenty-three years. Cycle battalion. Total service two years and four months. Field service twelve months.

Admitted: March 1, 1918.

Diagnosis on admission: Nephritis.

Past history: Entirely negative.

Present illness: Began February 12 with hematuria, frequency of urination (passing small amounts every hour during the day and six or seven times a night), burning pain on urination and urgency. Slight cough. No headache. Slight swelling in both hands, but no other edema. No giddiness or weakness. Admitted to Stationary Hospital February 17, where he was found to have albuminuria. Improved rapidly.

On admission to this hospital, frequency greatly diminished (only has to get up once at night); hematuria and dysuria gone. Complains of some pain in the small of the back, not radiating, which has developed since February 17.

Physical examination on admission: Does not appear ill. No edema or hyperpnea. Skin and mucous membranes entirely clear and of

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
February 21....	"Fair amount"			Report from Stationary Hospital
February 27....	"Trace"			Report from Stationary Hospital
March 2.....	+	0	0	0
March 4.....	+	0	0	Few hyaline
March 8.....	++	++	+	Frequent red blood cell casts
March 11.....	++	+++	+	Hyaline, finely granular and red blood cell casts
March 20.....	++	0	0	Finely granular

good color. Heart: apex impulse in the 5th space, 1 cm. to the left of the nipple line; dulness extends from the right border of the sternum to a point 2 cm. to the left of the left nipple line; soft blowing, systolic murmur at apex, not transmitted; no accentuations. Pulse 72, regular. Blood pressure: systolic, 116; diastolic, 82. Artery walls soft. Lungs clear except for slight relative dulness at extreme right base behind. Abdomen negative. No tenderness in loins.

March 2. Cystoscopic examination: Two confluent, light red patches, apparently old hemorrhages, in the paths of the small vessels on the inner side of the right ureteral ridge, just above the ureteral orifice. Remainder of bladder wall normal. Specimen removed with punch. External genitalia and seminal vesicles normal. Prostate slightly boggy and nodular about the outer border, but not indurated or enlarged. Kidneys cannot be felt.

March 4. Ophthalmoscopic examination negative. Phenolsulphonphthalein, 33 per cent.

March 9. Still has to urinate about three times a night.

March 24. Slight headache. Phenolsulphonphthalein, 48 per cent. Evacuated to England.

Pathologic report (by Captain Pappenheimer):

March 2. Small fragment of bladder mucosa: the epithelium appears intact throughout. The connective tissue is edematous and contains large pigment-bearing phagocytes. There is no definite hemorrhage. No inflammatory changes or vascular lesions.

Temperature: No records before admission to hospital. Temperature never above 99° while in hospital.

Case XVII

Age twenty-nine years. Infantryman. Total service eight years. Field service five months.

Admitted: March 11, 1918.

Diagnosis on admission: Nephritis.

Past history: Frequent colds and bronchitis in childhood and youth. For about eight years slight cough and expectoration. No pleurisy or hemoptysis. Some shortness of breath on exertion. Five years ago diphtheria, without complications. Was rejected for the army in 1915 because of pulmonary conditions and varicocele. Has always had to get up once or twice at night to urinate.

Present illness: Began about February 24, after he had been in the trenches about four days, with general weakness and an exacerbation of his cough. On March 3, he was seized with general pains and giddiness and suddenly fainted in his dugout. Next day noticed blood in his urine and pain in the lower abdomen at the end of urination, associated with urgency and frequency. The hematuria stopped after about three days, but the dysuria and frequency lasted a few days longer. Since then he has improved, but continues to have general pains, especially in the back and legs. No dyspnea or edema. Thinks his temperature was 104° on March 5.

Note of March 9 from Casualty Clearing Station gives temperature 99°.

Physical examination on admission: Does not appear acutely ill. Somewhat pale. Skin and mucous membranes clear. No hyperpnea or edema. Finger nails slightly curved, suggestive "clubbing."

Lungs: breathing rather high pitched over left upper lobe, diminished in both lower axillae and especially the left lower lobe behind, where there are also fine, moist râles. Heart: not enlarged; sounds of good quality; no murmurs or accentuations. Pulse 72, regular. Blood pressure: systolic, 122; diastolic, 66. Arteries soft. Abdomen negative. Some tenderness in both costovertebral angles and along both shins.

March 12. Still complains of pains in legs, back and shoulders. Phenolsulphonphthalein, 35 per cent.

March 13. Pains in back and shoulders continue; none in legs.

Cystoscopic examination: Two small spots in course of vessel just below and internal to right ureteral orifice, probably very minute hemorrhages. Remainder of bladder wall entirely normal.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
March 9.....	"Trace"	"No blood"		Report from Casualty Clearing Station
March 11.....	++	++	0	Many hyaline and red blood cell casts
March 12.....	++	+	+	Red blood cell casts
March 20.....	++	+	+	Red blood cell casts
March 23.....	+	++	++	Hyaline, coarsely granular and cellular

March 19. Been up two days. Has occasional pains at night. No nycturia.

March 23. Cystoscopic examination: Bladder mucosa and ureteral orifices entirely normal. Spots noticed before, no longer visible.

March 25. Complains of severe headache over the eyes. Blood pressure: systolic, 108; diastolic, 72.

No paralysis or alteration of reflexes.

Ophthalmoscopic examination negative.

Phenolsulphonphthalein, 70 per cent.

Headache disappeared after free catharsis.

April 4. No râles in chest today. Otherwise signs unchanged. General symptoms greatly improved. No urinary symptoms. Evacu ated to England.

Temperature. No records before admission to hospital. Three rises to 100° to 101° while in hospital; the last on March 30.

Case XVIII

Age twenty years. Infantryman. Total service one year. Field service eight months.

Admitted: June 13, 1918.

Diagnosis on admission: Inflammation of bladder.

Past history: Was a plumber in civil life. Has been subject to periodic headaches. Measles December, 1917. Was buried by shell a few weeks before admission to hospital.

Present illness: Seven weeks before admission to hospital had pains in legs, head and back, and in bladder region, accompanied by frequency of urination and scalding. Urine was red. Did not report sick and symptoms passed off in two days, leaving him with tired, drowsy feeling.

Five days before admission, sudden recurrence of similar pains, hematuria and dysuria.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
	+++	+++	+	Several hyaline and granular
June 28.....	+++			Few granular
July 3.....	++++	++		Several red blood cells and hyaline casts

Physical examination on admission: Complains of headache, pains in back and legs and slight frequency. Appears well nourished. Color good. Tongue coated. Teeth very bad. No hyperpnea or edema. No signs of hemorrhages in skin or visible mucous membranes. Lungs clear. Heart: not enlarged; sounds of good quality; no murmurs or accentuations. Pulse normal in rate and rhythm. Blood pressure: systolic, 135; diastolic, 85. Abdomen: tenderness over bladder region; kidneys neither tender nor palpable.

June 18. Radiograph shows no evidence of urinary calculus.

June 22. Cystoscopic examination: Bladder mucosa normal except for patch of seven or eight fading hemorrhages on posterior wall well above trigone. Ureteral catheterization: urines from bladder and from both ureters show moderate number of red blood cells and many blood casts, but no leucocytes.

June 27. Complains of pain in back. Gets up once a night to urinate.

June 30. Pain in bladder region.

July 5. Severe pains in legs last night. No tenderness. Slight diarrhea (six movements during day). No blood in stools.

July 7. Diarrhea has ceased. Pain in bladder region persists. Has had almost constant headache since admission.

Phenolsulphonphthalein, 50 per cent.

No note on temperature in records.

Case XIX

Age twenty-one years. Labor company. Total service three years. Field service twenty-three months.

Admitted: July 9, 1918.

Diagnosis on admission: Hematuria.

Past history: Was in infantry prior to attack of trench fever in May, 1917. Then in hospital three months. Subsequently in hospital twice for weakness, shortness of breath and pain on exertion in left chest.

Present illness: Began July 5 with headache and pains in right costovertebral region. The latter were dull and steady with occasional lancinating exacerbations. Next day had gross hematuria and terminal dysuria and extreme frequency (about every half hour at night). Vomited three times. Noted slight pain in left side of back as well as right.

At the Casualty Clearing Station July 8, diagnosis influenza with hematuria. Temperature 99°.

Gross hematuria still present July 9. Pains in back considerably diminished, but dysuria persists.

Physical examination on admission: Appears acutely ill and somewhat debilitated. Has slight, dry cough. No hyperpnea or edema. No signs of hemorrhages in skin or visible mucous membranes. Lungs clear. Heart: not enlarged; sounds of good quality; no murmurs or accentuations. Pulse regular, not rapid. Blood pressure: systolic, 110; diastolic, 80. Abdomen: marked tenderness in both hypochondria and both lumbar regions, with hyperesthesia. Right kidney barely palpable.

July 11. Cystoscopic examination: There are three groups of hemorrhagic spots on left, posterior lateral wall. Each group is a conglomerate, irregular mass, surrounded by small hemorrhages, some definitely fading. The largest group contains 30 to 40 hemorrhages. Proximal to these patches is a long area of congestion, fairly well

localized. There are two irregular, hemorrhagic splotches on right postero-lateral wall, near prostatic border, one on the trigone in the mid-line, and two groups higher on the posterior wall. There is marked congestion about the areas on the posterior wall. Remainder of bladder wall and ureteral orifices quite normal.

Urine culture: no growth on aerobic and anaerobic media (urine smoky with reddish tinge).

Blood culture sterile.

July 12. Complains pain in right flank. Right kidney slightly tender and possibly enlarged.

July 15. Right kidney still palpable, but not tender. Frequency persists (three times a night), without dysuria.

July 16. Only occasional slight pain in right flank.

Urethroscopic examination: On left side of verumontanum is a well defined hemorrhagic spot, and another at about the usual site of the utricle (not identified).

July 17. Much improved. No pains.

July 21. Pain in left side of back with tenderness in left costo-vertebral angle. Slight tenderness over palpable right kidney and in suprapublic region. Frequency continues unchanged. No dysuria. Heart and lungs negative.

Evacuated to England.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
July 9.....		"Obvious blood"		
July 9.....	+++	++++	0	Several granular and hyaline
July 13.....	0	0	+	Few granular
July 19.....	+	+	+	Occasional granular and hyaline
July 22.....	+	+	0	Few granular and cellular

Temperature: Frequently 99° by mouth, and never above 99.4°.

Case XX

Age twenty years. Engineer signal corps. Total service two and one-half years. Field service thirteen months.

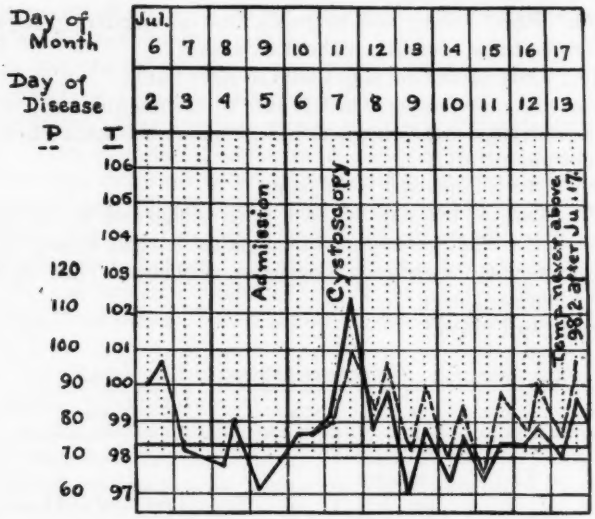
Admitted: July 9, 1918.

Diagnosis on admission: Nephritis.

Past history: In civil life worked in cotton-mill. Pneumonia at age of eleven. In hospital about two weeks with trench fever, six months ago.

Present illness: Began July 5, with headache, herpes labialis, hematuria and frequency of urination (four or five times during the night). Next day frequency ceased but hematuria continued. Noticed pain in lower abdomen during urination.

Physical examination on admission: Appears acutely ill. Somewhat pale. Slight, dry cough. No hyperpnea or edema. Marked herpes



CASE 20

about both corners of mouth. No signs of hemorrhages in skin or visible mucous membranes. Lungs: few fine râles at left base posteriorly after coughing. Heart: not enlarged; no murmurs or accentuations. Pulse regular, normal rate. Blood pressure: systolic, 128; diastolic, 62. Abdomen: spleen palpable 1 cm. below costal margin; liver and kidneys not felt; marked tenderness in both hypochrondria and in right lumbar region.

July 11. Cystoscopic examination: Bladder mucosa normal excepting one group of six fading hemorrhages, high on posterior part of left wall. Ureteral orifices normal.

Urine culture shows, after forty-eight hours, a Gram-positive streptococcus and a smaller Gram-negative bacillus, forming gas on anaerobic media. Subcultures show aerobic hemolytic streptococcus. (Urine smoky and slightly blood-tinged.)

Blood culture sterile.

July 12. Headache and severe pains in legs and back last night, with temperature 102.4°. Lungs clear.

July 13. Headache gone. Pain across sacrum and in thighs.

July 15. Feels well. Spleen still palpable. Some frequency (twice a night) and slight terminal dysuria. No history of malaria or tropical residence.

July 16. Urine culture sterile.

July 18. Some pain in back and legs and headache. Frequency unchanged. Spleen still palpable.

July 21. Pains and frequency persist. Spleen no longer palpable.

July 22. Evacuated to England.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
July 6.....	"Present"	"Blood stained"		
July 9.....	+++	0	0	Few hyaline
July 14.....	++	+	+	Few red blood cell and white blood cell casts
July 19.....	+	+	+	Moderate number of granular and cellular

Case XXI

Age forty years. Infantryman. Total service seventeen months. Field service seven months.

Admitted: July 10, 1918.

Diagnosis on admission: Influenza.

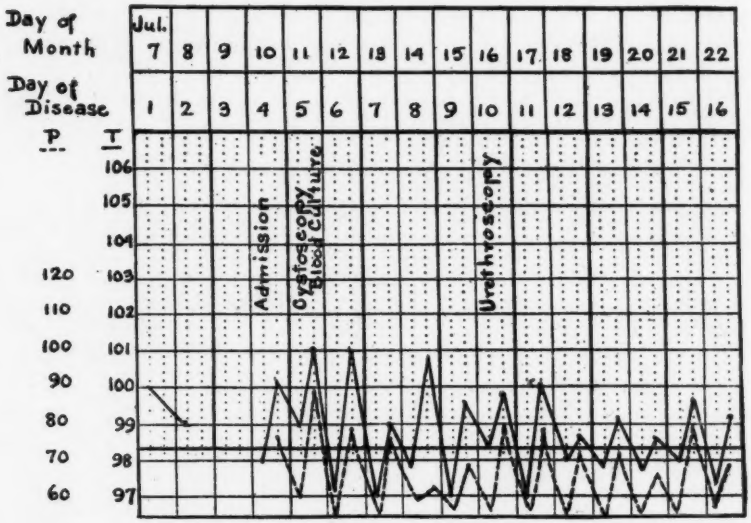
Past history: Not obtained.

Present illness: Began July 7 with headache, cough and pains in shins. Two days later frequency (four times a night), dysuria and hematuria. Also had chilly sensations and dizziness.

Physical examination on admission: Dysuria and frequency persist. Has considerable cough and headache. No edema or hyperpnea. No signs of hemorrhages in skin or visible mucous membranes. Lungs:

many musical râles. Heart: not enlarged; faint systolic murmur at apex; no accentuations. Abdomen negative. Marked tenderness in both shins.

July 11. Cystoscopic examination: On right half of posterior bladder wall, well above trigone is an area of conglomerate hemorrhages about 2 cm. in diameter. On posterior part of left lateral wall is an elongated patch of well defined hemorrhages which extends through an area of faint hemorrhages to a group of more distinct hemorrhages on the left half of the anterior wall. Remainder of bladder wall seems quite normal.



CASE 21

Urine blood-stained and smoky.

Right ear shows herpetic lesion involving whole auricle.

Blood culture sterile.

July 15. Complains of anorexia and pains in ears and tinnitus. Headache and shin pains have ceased. Dysuria and frequency diminished (twice a night).

July 16. Urethroscopic examination: One hemorrhage 2–3 mm. in diameter found on anterior declivity of verumontanum. Rest of posterior urethra normal.

July 22. Some pains in shins with very little tenderness. Dysuria has ceased, but frequency persists (twice a night).

Evacuated to England.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
July 11.....	++++			Many hyaline and granular
July 12.....	++++	0	0	Many granular
July 14.....	++	+	+	Many granular and cellular
July 19.....	+++	+	+	Moderate number of granular and cellular

Case XXII

Age twenty-two years. Driver. Total service thirty-four months. Field service seven months.

Admitted: July 10, 1918.

Diagnosis on admission: Nephritis.

Past history: Tonsillitis twice. Rejected for army early in the war because of deafness.

Present illness: Began about a week before admission with headache, weakness and anorexia. Three days later noticed hematuria and frequency (two or three times a night), but no dysuria. Slight diarrhea at onset. Gross hematuria ceased July 6. Has had shooting pains across lower part of back.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
July 11.....	++			Several hyaline
July 14.....	0	+	+	Few red and white blood cell casts
July 19.....	0	+	+	Occasional granular

Physical examination on admission: Appears moderately ill. Skin and mucous membranes clear. No edema or hyperpnea. Lungs clear. Heart: area of dulness extends 13 cm. to the left and 4 cm. to the right of the mid-line; no murmurs or accentuations. Pulse regular, rate normal. Blood pressure: systolic, 150; diastolic, 78. Abdomen: slight tenderness in both lumbar regions.

July 11. Urine smoky.

Cystoscopic examination: High up on posterior part of right lateral wall is a triangular hemorrhagic spot, surrounded by a small network of vessels, two of which definitely end in hemorrhages. Remainder of bladder and ureteral orifices normal.

July 16. Still slight headache.

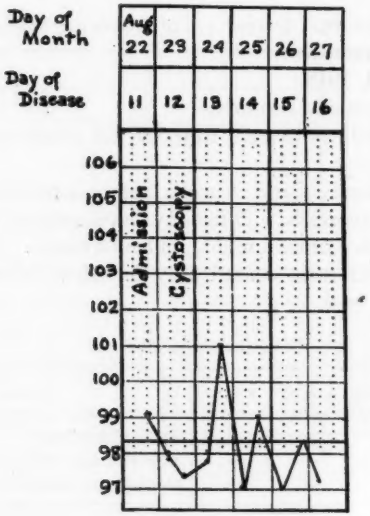
July 17. Dysuria has appeared, without frequency or hematuria.

July 20. Transferred to hospital for skin diseases for scabies.

Temperature has never been recorded above 99° by mouth.

Case XXIII

Age twenty-one years. Infantryman. Total service thirty-eight months. Field service nine months.



CASE 23

Admitted: August 22, 1918.

Diagnosis on admission: Hematuria.

Past history: Six years ago attack of pains in knees, ankles and back, without swelling of joints. In 1916 or 1917, while in the army, had precordial pain and exertional dyspnea; diagnosis of cardiac valvular

disease and dilatation was made. Still has pain on exertion, but can do all but very heavy duties.

Present illness: Began August 12 with hematuria and dysuria. Felt feverish. Later severe headache and pains in back, knees and ankles.

Radiography at Casualty Clearing Station revealed no urinary calculus.

Physical examination on admission: Appears well nourished, with good color. Skin and visible mucous membranes clear. No edema or hyperpnea. Lungs clear. Heart: not enlarged; no murmurs; second sound everywhere ringing in character. Pulse regular. Rate normal. Blood pressure: systolic, 128; diastolic, 80. Abdomen: slight tenderness in both hypochondria; kidneys not felt.

August 23. Cystoscopic examination: Two or three small, fading hemorrhages in the course of vessels on the posterior wall. Remainder of bladder wall normal.

Urine culture: Sterile (urine blood-tinged). Smears negative.

August 27. Still has pain in back. No tenderness.

Evacuated to England.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
August 17.....	"Present"	"Present"		Urine smoky
August 23.....	+++	+++	+++	Many granular

Case XXIV

Age nineteen years. Infantryman. Total service nine months. Field service three months.

Admitted: August 28, 1918.

Diagnosis on admission: Hematuria.

Past history: Scarlet fever in infancy. Has had precordial pain and slight shortness of breath at intervals.

Present illness: Began August 20 with diarrhea. Three days later malaise, but diarrhea had ceased. Next morning noticed hematuria and pains in back, legs and chest. Hematuria ceased August 27.

Physical examination on admission: Complains of dysuria and general weakness. Appears acutely ill. Color good. Skin and mucous membranes clear. No edema or hyperpnea. Lungs clear. Heart: not enlarged; no murmurs or accentuations. Abdomen: tenderness in left hypochondrium and both lumbar regions.

August 30: Severe pain and tenderness over sacrum and in flanks. No tenderness in costo-vertebral angles. Still dysuria and frequency (three times a night).

September 1. Cystoscopic examination: On right bladder wall is a confluent hemorrhagic patch about 2 by 0.5 cm. and there is a similar area on posterior wall just above left ureteral orifice. One small, fading group of hemorrhages on left anterior wall. Remainder of bladder wall normal.

Evacuated to England.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
August 28.....	+	+++	+	Hyaline, granular and red blood cell casts present

Temperature: No records before admission to this hospital. 100.8° August 30. Otherwise normal.

Case XXV[5]

Age twenty-one years. Infantryman. Total service two and one-half years.

Admitted: Date unknown.

Diagnosis on admission: Gas poisoning.

Past History: Gonorrhea one year ago. Was well until present illness.

Present illness: Poisoned by shell gas in July, 1918. At that time thinks he passed blood in urine for one day only. At Base Hospital improved and was placed on "work detail." The morning of October 27 noticed hematuria and frequency of urination, associated with general malaise.

October 29. Voiding small amounts of bloody urine every forty-five minutes, with considerable dysuria.

Physical examination: Appeared moderately ill. No edema or hyperpnea. No signs of hemorrhages in skin or visible mucous membranes. Lungs and heart normal. Abdomen: negative. External genitalia, prostate and seminal vesicles normal.

[5] Case seen by one of us in consultation at a Base Hospital in the American Expeditionary Force.

Urine: Albumen + + + +. Macroscopic blood. Epithelial and red blood cell casts.

Blood count: W. B. C. 7200; 50 per cent small mononuclears.

Phenolsulphonphthalein, 27 per cent on two successive days.

October 30. Urine smoky.

Cystoscopic examination: Five to six small hemorrhages to the inner side of the left ureteral orifice, and another group in the midline, just above the trigone. Remainder of mucosa and ureteral orifices normal.

Temperature: Reached 102°, October 28; 101°, October 29; 101.5°, October 30.

Case XXVI

Age forty-five. Infantryman. Total service nineteen months. Field service thirteen months.

Admitted: July 13, 1917.

Urine examinations

DATE	ALBUMIN	B. B. C.	W. B. C.	CASTS
July 7.....	"Albumin present"	"Blood present"		Granular (Casualty Clearing Station)
July 13.....	+++	+	+	Present

Diagnosis on admission: Hematuria.

Past history: Scarlet fever in childhood. Rheumatic fever nine years ago and five years ago. Was refused life insurance three years ago for heart disease. Has had dyspnea on exertion at intervals for years, but has been able to "carry on" without any difficulty.

Present illness: Began July 7, while in trenches, with headache, pains in shins, slight chills, temperature, hematuria and frequency of urination. No edema.

Physical examination on admission: No hyperpnea or edema. Skin and mucous membranes clear. Heart: somewhat enlarged to the left and downwards, with a systolic murmur at the apex, but no accentuations. Pulse 72, regular. Blood pressure: systolic 110; diastolic 78. Lungs: slight signs of emphysema. Abdomen negative. No tenderness made out. Cystoscopy not done and patient evacuated to England.

Temperature: 101.8° July 9; returned to normal July 11.

Case XXVII

Age twenty years. Infantryman. Total service one year. Field service six months.

Admitted: March 11, 1918.

Diagnosis on admission: Nephritis.

Past history: "Heart disease" three years ago (pains in heart and shortness of breath). Since then has been short of breath on exertion (after running only twenty yards) and has always had to drop out on route marches. Was never rejected for the army. Was a miner in civil life.

Present illness: Began February 27, with pains in back, abdomen and legs, headache, dizziness, swelling of the face, shortness of breath on the least exertion and pain in the back during urination. Urine contained blood.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
March 4.....	"Fairly large amount"	"Blood present"		Casualty Clearing Station
March 6.....	"Albumin +"	"Still some blood"		Casualty Clearing Station
March 12.....	+++	++	++	Hyaline, finely granular, and a great many red blood cell casts

Physical examination on admission: Does not look acutely ill. No edema. Respiration rather rapid and superficial. Heart: not enlarged; no murmurs; pulmonic second sound somewhat accentuated. Pulse 90, regular. Blood pressure: systolic 140; diastolic 96. Lungs: slight dulness over right upper lobe with a few subcrepitant râles at right apex, behind. Abdomen negative.

March 12. Considerable pain in legs and arms.

Patient evacuated to England without cystoscopy.

Temperature: No records except March 7 when temperature was 100°.

Case XXVIII

Age twenty-six years. Infantryman. Total service fourteen months. Field service eight months.

Admitted: August 21, 1917.

Diagnosis on admission: "Nephritis." (?)

Past history: Was told he had "kidney trouble" when he was ill in Liverpool Hospital twelve years ago, but has had no symptoms since then.

Present illness: Began July 16, when he was going up to the trenches, with headache, lumbar pains, sweating, weakness, dyspnea on exertion, hematuria, urgency of urination, difficulty in starting stream, pain during micturition and slight frequency.

Physical examination on admission: No hyperpnea or edema. Skin and mucous membranes clear. Heart: not enlarged; no murmurs or accentuations. Pulse 78, regular. Blood pressure: systolic 136; diastolic 88. Lungs and abdomen negative. No tenderness anywhere.

August 23. Cystoscopic examination: Bladder mucosa and ureteral orifices normal.

External genitalia, prostate and seminal vesicles normal.

Kidneys not tender or palpable.

Urine examinations

DATE	ALBUMIN	CASTS
August 19	"Copious hematuria"	Field Ambulance
August 19	"Hematuria"	Casualty Clearing Station
August 21		Many granular

Temperature: No records before admission. 100° August 21, returning to normal by August 26.

Case XXIX

Age twenty-eight years. Infantryman. Total service seventeen months. Field service seven months.

Admitted: September 1, 1917.

Diagnosis on admission: Albuminuria.

Past history: Scarlet fever at 12. Mechanic in civil life. Slight dyspnea on exertion for ten years, but has been able to "carry on." Slight cough two or three days before present illness.

Present illness: Began August 25, 1917, with headache, pains in the legs and back, dizziness and temperature. At the same time, he noticed pain during micturition and began to pass blood in his urine. Temperature and hematuria continued until the 29th.

Physical examination on admission: Looks acutely ill. No hyperpnea or edema. Herpes labialis but no other skin lesions. Heart: not enlarged; no murmurs or accentuations. Pulse 90, regular. Blood pressure: systolic 128; diastolic 56. Lungs and abdomen negative. Some tenderness along shins and in right lumbar region.

September 3. Cystoscopic examination: Bladder mucosa and ureteral orifices normal.

External genitalia normal. Prostate: right lobe somewhat enlarged and indurated. Seminal vesicles normal. Kidneys neither tender nor palpable.

Culture of urine: Staphylococcus albus on both glucose-ascitic-agar and glucose-agar.

October 10. Urine still positive and patient looks debilitated, although pains have been absent for more than a month.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
August 25.....	"Slight trace"	"Blood +"		Field Ambulance
August 26.....		"Trace of blood"		Casualty Clearing Station
August 29.....		"No blood"		Casualty Clearing Station
September 1....	0	++	0	0
September 5....	0	0	0	0
September 8....	+	0	+	Granular
October 15.....	++	+	+	0

Temperature: 102.6°, August 25; 100.2°, August 26. No other records until admission. 101.6° September 1. After this not above 99° while in the hospital.

Case XXX

Age twenty-nine years. Artilleryman. Total service one year and three months. Field service eight months.

Admitted: September 1, 1917.

Diagnosis on admission: Acute nephritis.

Past history: Was rejected in 1914 as "medically unfit," but does not know why. Was a goods porter in civil life and has been a bombardier in the line. Has always been able to "carry on."

Present illness: Began August 25, with severe general pains, especially in the back and legs, frontal headache, extreme weakness and marked hematuria, without any dysuria, frequency or edema. On the night of the 26th had a chill. Dyspnea on exertion at onset.

Physical examination on admission: No hyperpnea or edema. Skin and mucous membranes clear. Heart: not enlarged; no murmurs or accentuations. Pulse 66, regular. Blood pressure: systolic 130; diastolic 78. Lungs negative. Tenderness in upper abdomen and both lumbar regions. Liver, spleen and kidneys not felt.

September 3. Cystoscopic examination: Bladder mucosa and ureteral orifices normal.

External genitalia normal. Right side of prostate and right seminal vesicle somewhat indurated. Kidneys not tender or palpable. Urine cultures; some colonies of Staphylococcus albus on both glucose-ascitic-agar and glucose-agar.

September 5. Severe general pains today.

September 8. Pains gone.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
August 25.....	"Very marked"	"Very marked"		Field Ambulance
August 27.....	"Slight"	"Present"		Casualty Clearing Station
September 1....	+++	++	0	Red blood and cell casts
September 5....	+	+	+	Granular
September 9....	++	+	+	Many granular and hyaline

Temperature: Records show occasional elevations to 99.2° by mouth. Records incomplete.

Case XXXI

Age twenty years. Infantryman. Total service nine months. Field service seven months.

Admitted: February 3, 1918.

Diagnosis on admission: Nephritis.

Past history: Was rejected for army once for reasons unknown to him, but was accepted only two weeks later. Has been somewhat short of breath on route marches and has occasionally had to fall out. Heavy cold with cough, just before present illness.

Present illness: Began January 24, with slight swelling of feet, face and body, headache, dizziness, frequency of urination. Cough had almost disappeared when present illness began.

Physical examination on admission: Looks acutely ill. No hyperpnea or edema. Slight ptosis of left upper eyelid with flattening of the left side of face. Skin and mucous membranes clear. Heart: no enlargement; median to the apex impulse, in 3rd and 4th interspaces, is a rough, superficial, systolic murmur, intermittent probably cardio-respiratory. Pulse regular, not rapid. Blood pressure: systolic 140; diastolic 90. Marked tenderness in back and shins.

Blood count: W. B. C. 17,000; p.m.n. 72 per cent; lymphocytes 20 per cent; large mononuclears 7 per cent; basophiles 1 per cent.

Ophthalmoscopic examination negative.

February 5. Cystoscopic examination: Bladder wall and ureteral orifices entirely normal.

February 11. Phenolsulphonphthalein, 60 per cent. Blood pressure: systolic 126; diastolic 84.

February 24. Pains and tenderness have now disappeared.

February 28. Severe headache. No pains in legs or back. Pulse rather rapid. Evacuated to England.

Urine reports

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
February 3....	"Present"	"Smoky"	+	Occasional granular
February 5....	++	0	+	Many hyaline
February 14....	+	+	+	Granular, hyaline and cellular
February 18....	+	0	0	Granular, hyaline and red blood cell casts
February 24....	+	+	0	Frequent hyaline

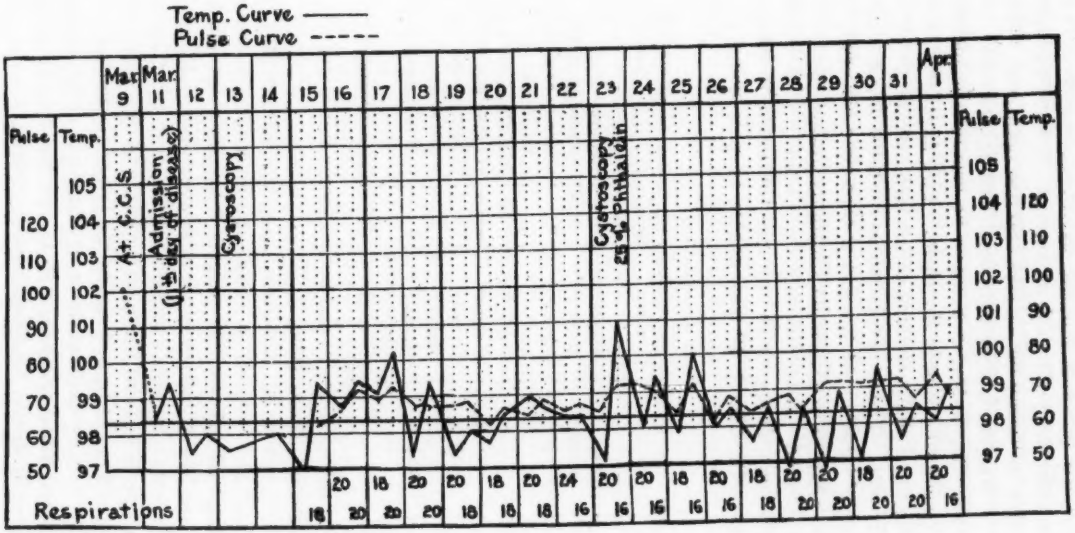
Temperature: No records before admission. 101.2°, February 3; frequent elevations to 99° or 100° until discharge.

Case XXXII

Age twenty-five years. Infantryman. Total service one year and eight months. Field service thirteen months.

Admitted: March 11, 1918.

Diagnosis on admission: Nephritis.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(1st Admission) Cystoscopy & Phthalein
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Case 32

Past history: No previous illnesses except occasional sore throat. Has been somewhat short of breath on exertion for some years, but has always been able to "carry on." Has also had occasional "fluttering of the heart." Was an outdoor insurance clerk in civil life.

Present illness: Began March 1, while he was on the march, with weakness and some wheezing in the chest. Two days later he noticed pains in the legs and slight swelling of the feet and the next morning puffiness of the face. The edema increased for three or four days, with some shortness of breath. At the end of that time his urine was examined and he was sent to a Casualty Clearance Station where albumin and blood were found. After entering the Casualty Clearing Station dyspnea and edema disappeared but legs continued to ache. Had some headache. On March 10 was unable to pass urine for some

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
March 8.....	"Large amount"	"Blood present"		Report from Casualty Clearing Station
March 11.....	+++++	++++	0	Coarsely granular and red blood cells casts
March 12.....	+++++	++++	++	Red blood cell casts
March 20.....	+++	++++	+++	Hyaline and granular
March 23.....	+++	"Grossly bloody"	+++	Granular and red blood cell casts
March 26.....	+++	"Grossly bloody"	+++	Cellular casts

hours but was finally successful and noticed some initial dysuria. No urgency or frequency at any time.

Physical examination on admission: Appears acutely ill. Slight hyperpnea, cough and hoarseness. Skin and mucous membranes pale but clear. Slight edema over the sacrum. Lungs: voice and breath sound harsh over left scapular region; râles over whole left lower lobe behind; dulness and diminished breath sounds over right lower lobe behind. Heart: apex impulse 11 cm. to the left in the 5th space; dulness extends 5 cm. to the right and 13 cm. to the left of the midline; sounds of good quality; soft, systolic murmur at the apex; no accentuations. Pulse 84, regular. Blood pressure: systolic 148; diastolic 90. Arteries soft. Abdomen negative. No tenderness anywhere.

March 12. Complains severe pains in legs.

March 13. Pains in legs less severe. Signs in chest unchanged.

Cystoscopic examination: Voided urine grossly bloody. Definitely bloody urine seen coming from both ureters. Bladder mucosa normal except for area of congestion high up on posterior wall. No hemorrhages.

March 23. Cystoscopic examination: Voided urine smoky. Urine from ureters of same character, not definitely bloody. Bladder wall and ureteral orifices normal.

Phenolsulphonphthalein 25 per cent.

March 25. Complains of urgency, frequency and terminal dysuria for the first time. As urine shows pus, this may be due to a mild infection.

Evacuated to England.

Case XXXIII

Age thirty-four years. Pioneer. Total service thirty months. Field service twenty-four months.

Urine examinations

DATE	ALBUMIN	R. B. C.	CASTS
June 12.....	"Present"	"Blood present"	
June 14.....	"Present"	"Blood present"	
June 16.....	++++	+++++	
June 17.....	+++	+++	
June 20.....	+++	+++	
June 25.....	+++	++++	Several granular and red blood cell casts

Admitted: June 15, 1918.

Diagnosis on admission: Nephritis.

Past history: Was disabled by wound of right leg in March, 1918, and has subsequently acted as cook in forward area.

Present illness: Began June 5 with dizziness, headache, shortness of breath, swelling of face and legs, dysuria, marked frequency and hematuria. Report from Casualty Clearing Station notes swelling of face and questionable edema of legs on June 10.

Physical examination on admission: Urine claret-color. Skin and mucous membranes clear. Possibly slight edema of ankles and back. No hyperpnea. Lungs clear. Heart: not enlarged; faint systolic

murmur at apex. Pulse regular, rate normal. Blood pressure: systolic, 118; diastolic, 80. Abdomen: slight tenderness in lumbar region.

June 16. Cystoscopic examination: Bloody urine seen issuing from both ureters. No hemorrhages found in bladder wall.

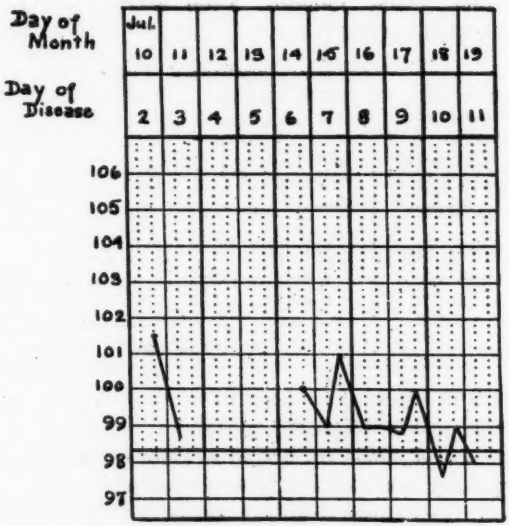
June 25. Has been up and about ward without symptoms for some days.

Evacuated to England.

Temperature: No notes before June 10. 100.8°, June 13; 100.4°, June 15; 99.8°, June 16. Otherwise not over 99°.

Case XXXIV

Age thirty-four years. Headquarters staff sergeant in front area. Total service three and a half years. Field service twenty months.



CASE 34

Admitted: July 20, 1918.

Diagnosis on admission: Nephritis.

Past history: Electrical engineer in civil life. Rheumatic fever without complications in 1909. At age of twelve was struck on forehead

and says he has never been entirely well since. Had two "fits" at the age of eighteen, but none before or since.

Present illness: Began July 9 with feverish sensations, general malaise, anorexia, prostration and general pains. Next morning temperature 103.4° and noticed hematuria, but no dysuria or frequency. Vomited after entering Casualty Clearing Station, July 12. Note from Casualty Clearing Station, July 15: no edema; tenderness in shins. July 17, abdomen tender, especially over left kidney.

Physical examination on admission: Poorly developed. Appears chronically ill. No pallor. Large scar in forehead beneath which skull seems depressed. Skin and visible mucous membranes clear. No edema or hyperpnea. Lungs clear. Heart: not enlarged; no murmurs or accentuations. Blood pressure: systolic, 118. Abdomen: slight tenderness over both hypochondria and in both costo-vertebral angles; right kidney just palpable.

July 22. Cystoscopic examination: Bladder mucosa entirely normal. Evacuated to England.

Urine examinations

DATE	SPECIFIC GRAVITY	ALBUMIN	R. B. C.	W. B. C.	CASTS
July 14.....		"Much albumin and blood"			
July 15.....	1020	"Present"	"Blood present"		
July 17.....			"Blood macroscopic"	+	"Large number epithelial and granular"

Case XXXV

Age nineteen years. Infantryman. Total service ten months. Field service five months.

Admitted: November 11, 1917.

Diagnosis on admission: Pyrexia of unknown origin.

Past history: Scarlet fever in August 1915; sick six weeks, but no renal complications. When very young had chronic bronchitis.

Present illness: About October 1, returned to rest camp after a turn in the line. Shortly after this noticed dizziness on slight exertion. No shortness of breath and no headache, nausea, vomiting or urinary

symptoms. Dizziness continued after return to line, bothering him especially on the firing step. On October 13 fainted and was taken to Casualty Clearing Station. Up to this time had not reported sick. Remained in Casualty Clearing Station until evacuated to this hospital. At time of admission to Casualty Clearing Station had a temperature of 102°. Did not feel dizzy in bed. At the end of a week, temperature had returned to normal and he was allowed up. After two days began to have frontal headache, but remained up five days more. Says that at this time specimen of urine was found negative. Headache continued after he had gone to bed, and he had some temperature and pains in the back and legs. These pains he had not had before. After fourteen days of normal temperature it rose to 102° on November 2. Was found to have moist râles in both sides of chest.

Physical examination at time of admission: This examination, together with history, gave the impression that he had trench fever. Appeared quite ill. Heart: not enlarged; systolic murmur at apex and over pulmonary area, soft and blowing in character. Lungs clear. Spleen not palpable. No areas of tenderness in legs, back or head.

November 14. Some pain in left side of face, localized to upper jaw. No tenderness of teeth. No swelling of gums. Some swelling beneath left eye.

November 15. Vomited once. Pains in legs and headache. Swelling of face slight. Urine shows albumin and casts.

November 17. Vomited once. At 7:30 p.m. had a short convulsion, followed at brief intervals by two more. Pulse 120, very weak. Blood pressure: systolic 160; diastolic 100. Phlebotomy 500 cc.

November 18. Blood pressure: systolic 140; diastolic 80. In semi-stupor. Easily aroused. Tongue moist. Pulse and heart action much stronger. Frequent extra systoles.

November 20. Slight puffiness under eyes. No other edema. Pulse and heart action slow, with occasional extra systoles. Blood pressure: systolic 150; diastolic 100.

November 21. Phenolsulphonphthalein, 45 per cent. Blood pressure: systolic 160; diastolic 110.

November 23. Semi-comatose. Neck stiff. Moderate Kernig's sign. Knee jerks moderately active. Slight external strabismus of right eye. Blood pressure: systolic 190; diastolic 130. At noon, 12 cc. spinal fluid removed under increased pressure. Severe headache. Spinal fluid shows no increased cell count. After lumbar puncture wakened slightly, and complained of terrible headache. Later relapsed

into coma. Blood pressure was unchanged immediately after lumbar puncture.

November 24. Still in deep coma. Pulse 88, full and regular. Blood pressure: systolic 145; diastolic 120. Phlebotomy 400 cc. in afternoon. After phlebotomy, blood pressure: systolic 130; diastolic 100.

November 25. Fed with gavage tube. In evening awoke from coma and refused gavage.

November 26. Very hard to arouse. Tongue moist. Blood pressure: systolic 135; diastolic 105.

November 27. Less comatose. Face a trifle more edematous. Blood pressure: systolic 150; diastolic 110.

November 30. Blood pressure: systolic 130; diastolic 100. In stupor. Complains of some headache. Vomited once.

December 1. Sleepy but can be roused. External strabismus of right eye continues. Slight paralysis of lower face. Slight drooping of upper lid of left eye. Marked exaggeration of knee jerks. No clonus.

December 5. Phenolsulphonphthalein, 45 per cent. Blood pressure: systolic 128; diastolic 95.

December 7. Has developed some boils on his back one of them being very large, due to poultices. Phenolsulphonphthalein, 45 per cent.

December 15. Examination by Captain Casamajor (neurologist to the hospital): Eyegrounds normal. Internal strabismus of left eye. Screen and parallax test shows marked exophoria about equal in both eyes. Slight left facial paralysis. Strength of arms and legs equal on both sides. Arm reflexes: left stronger than right. Knee jerks and ankle jerks: right stronger than left. No clonus. Double Babinski.

Conclusion: Lesion in cortical vessels, probably multiple cortical hemorrhages.

December 18. Cystoscopic examination: There are two hemorrhages high up on the posterior wall in the median line, very red. One large hemorrhage high up on the lateral wall, near the apex of the bladder. The remainder of the mucosa is normal.

External genitalia, prostate and seminal vesicles normal.

Kidneys not palpable; no tenderness.

Urine appears smoky.

December 19. Vomited this morning. Looks somewhat drowsy. Blood pressure: systolic 140; diastolic 102.

December 24. Had sharp pain in the left loin last night. Slight tenderness in left costo-vertebral angle; kidneys not palpable.

January 8, 1918. Cystoscopic examination: Entirely negative.

January 11. Blood pressure: systolic 150; diastolic 98. Is walking about ward. Feels well. Has occasional headaches. Appetite good. Face much fuller and looks a trifle puffy. No evidence of paralysis at present.

January 13. Blood pressure: systolic 140; diastolic 100.

February 4. Since last note has been gaining steadily in strength and has felt perfectly well. The urine has however never become negative. Today complains of pains in back. Marked tenderness in both costo-vertebral angles and in both hypochondria. No masses felt. Face seems a trifle puffy and tense. Slight coryza and cough. Heart: apex impulse 7 cm. to the left in the 5th space; dulness extends from a point 5 cm. to the right in the 4th space to a point 13 cm. to the left in the 5th space; soft, systolic murmur at the apex, not transmitted; no accentuations. Pulse 84, regular. Blood pressure: systolic 128; diastolic 100. Some sonorous and sibilant râles over left chest.

February 5. Pains better. Still complains some disability in left hand. No detectable difference in strength in two hands but an apparent delay in voluntary response in the left hand. Reflexes more active in left arm than in right.

February 16. Phenolsulphonphthalein, 47 per cent.

February 23. Blood count; Hemoglobin 80 per cent; R.B.C. 5,200,000; W.B.C. 8200; p. m. n. 66 per cent; leucocytes 34 per cent. Slight coryza. Herpes of upper lip.

March 3. Phenolsulphonphthalein, 70 per cent.

March 4. Patient looks run down, thin and pale. Still complains of slight pain on urination; no other pains. Skin and mucous membranes clear except for herpes. Lungs: slight relative dulness in right infraclavicular region. Heart: apex 8 cm. to the left in the 5th space; area of cardiac dulness extends 5 cm. to the right in the 4th space, 11 cm. to the left in the 5th space; sounds of good quality; slight cardio-respiratory murmur at the apex. Pulse 90, regular. Blood pressure: systolic 150; diastolic 104. Liver palpable as a hard, rounded edge, 2 cm. below the costal margin, on deep inspiration. Reflexes all very active. No signs of paralysis. Discharged to England.

April 18. Report from patient in England states: No improvement in general condition. Has scarcely been free from pains in the back and has frequent headaches, associated with dizziness. For the last two or three weeks pains in the chest, especially in the region of the heart, sometimes shooting downward, sometimes to the left shoulder

and back and down the left arm to the elbow. Occasionally slight shortness of breath.

Pulse irritable, running up to 110 on very slight exertion and becoming irregular.

Four urine tests all revealed albumin.

Urine examinations

DATE	ALBUMIN	R. B. C.	W. B. C.	CASTS
October 24.....	0			Verbal report of patient only
November 16...	++	+	0	Many hyaline and granular
November 25...	0	0	0	0
December 1....	++	+	0	Few hyaline
December 5....	++	0	0	Few granular
December 9....	++	+	+	Hyaline and granular
December 14....		"Guaiac strongly positive"		
December 15....	++++	"Grossly bloody"	+	Few granular
December 18....		"Smoky"		
January 15.....	0	0	0	0
January 24.....	+++	+	+	Few granular
February 5....	++	0	0	0
February 16....	++	++	+	Occasional granular and hyaline
February 25....	+	+	0	Hyaline and granular
March 4.....	+	+	0	Hyaline and granular
April 18.....	Albumin present on four examinations since March 4 (patient's report from England)			

Temperature: Records before admission to Hospital very incomplete, but temperature 102° October 15 and November 2. After this no temperature above 99.4° recorded. Unfortunately no temperature record during period of acute cerebral symptoms.

Case XXXVI

Age thirty-six years. Infantryman. Total service eight months. Field service four months.

Admitted: November 1, 1917.

Diagnosis on admission: Nephritis.

Past history: Says he was poisoned by beer two years ago and was in bed a month with swelling of the face and limbs.

Present illness: Onset October 12, when he noticed that his urine was bloody. No dysuria. On the 15th began to have headache and vomiting. No edema or dyspnea. Has vomited constantly since the 15th, but hematuria cleared up some time ago.

Note from Casualty Clearing Station: Admitted October 15. Urine shows considerable albumin. October 22, less albumin. Vomiting frequently. Almost impossible to get him to retain food or medication.

Physical examination on admission: Looks acutely ill. Very stuporous. Impossible to obtain a good history. Vomiting constantly; face slightly swollen; no other edema. Old discharging, superficial lesions resembling impetigo, on both legs. Breath urinous; mouth foul; tongue dry and thickly coated. No hyperpnea. Heart: apex and left border of cardiac dulness just to the left of the nipple line in the 5th space; no enlargement to the right; no murmurs or accentuations. Pulse 54, regular. Blood pressure: systolic 178; diastolic 110. Arteries very hard. Abdomen and lungs negative.

November 4. In semi-stupor. Tongue very dry and coated. Breath foul. Vomiting food and fluids continuously. Blood pressure: systolic 150; diastolic 100.

November 6. Breathing irregular. Condition otherwise unchanged. Vomiting continues. Blood pressure: systolic 145; diastolic 100.

November 7. Slight improvement in the morning. Seemed less stuporous. High hot colon irrigation returned with a considerable amount of clotted blood. In the afternoon vomited moderate amount of blood. Mouth and gums have been bleeding for some time.

November 8. No bleeding this morning. Has stopped vomiting. Breathing of an irregular Cheyne-Stokes type. Pulse slow and irregular in force and rhythm. Heart: rough thrill, systolic in time, over precordium; rough, harsh, superficial murmur over mid-sternum transmitted toward apex (probably pericardial). Blood count; W.B.C. 17,000; p. m. n. 86 per cent.

November 9. Has not vomited, but has been passing large, tarry stools. Marked tenderness in upper abdomen. No urine passed since last night, and attempt at catheterization failed because of stricture of urethra. Pulse more rapid. Heart: apex in the 5th space, 2 cm. to the left of the nipple line; loud, superficial, friction rub, heard over sternum. Abdomen very tender. Large, discharging ulcer on leg. Bleeding from bowel continues. Blood pressure: systolic 190; diastolic 100. Lungs show signs of pneumonia at left base.

November 10. Urine shows considerable albumin, very many red blood cells and occasional hyaline and granular casts. Died at 4 p.m. with pulmonary edema.

Temperature: No records before admission to hospital. While in hospital never above 99°.

Autopsy report (by Capt. Pappenheimer): The body is moderately emaciated and pale. Eyes prominent. Lips and gums covered with dried blood. Teeth careous. Gums spongy. There is a group of bright red, fresh petechial hemorrhages over the interscapular region and on the dorsum of the right arm. Punched out ulcer over upper third of right shin, over which skin is undermined for some centimeters. Below head of right fibula, circular scar covered by scab. Smaller similar lesion over lower part of tibia. No edema. Inguinal glands right side enlarged to size of large almond. In pericardial sac 20 cc. of turbid, slightly brownish fluid.

Lungs: Left, heavy, entire lower part dark red, with glistening pleura, lower lobe nodular. In posterior portion of upper lobe dark red, elevated areas, firmer than rest of lobe, which is dry, pale and slightly emphysematous. Lower lobe irregularly sprinkled with elevated, granular, reddish-grey patches, less than 1 cm. in diameter, between which lung tissue is in part aerated, in part dark red and airless. Bronchi pale and contain little blood-stained mucus.

Right: lighter than left, emphysematous and inelastic. Dark in posterior portion. Middle of posterior border of upper lobe shows projection about 2 cm. in diameter, distinctly firm and greyish-red, somewhat the appearance of an infarct. Lower lobe well aerated in general, rather sparsely sprinkled with small red areas of hemorrhage or very early consolidation.

Heart: not enlarged. Over both ventricles, particularly along course of vessels, are scattered bright red, blotchy hemorrhages. At base of left auricular appendix, more extensive hemorrhage where epicardium is slightly roughened. On section left auricle shows hemorrhage described, extending through auricular muscle and visible as a bluish blotch beneath thickened endocardium. Valves all normal. Ascending aorta in region of coronary sinuses and above them shows elevated, yellowish-white plaques, between which the intima is the site of shallow linear wrinkles.

Liver and spleen: Normal in appearance.

Kidneys: Left: Distinctly enlarged, measuring 14 by 8 by 5 cm. Capsule splits on stripping, leaving delicate, slightly adherent inner

layer. Surface smooth, dark brownish-red, stippled with dark red, irregular blotches, 1 or 2 mm. in size. On section color dark, pyramids darker than cortex. Markings obscured by irregular reddish streaks but not distorted. Kidney tissue moist and bloody. Glomeruli small and inconspicuous. Mucosa of pelvis shows a few, bright red, blotchy hemorrhages. Vessels not thickened or prominent. Right: Kidney similar to left, except for absence of pelvic hemorrhages.

Bladder: The mucosa shows profuse, large, bright red hemorrhages, quite irregular and in places confluent, distributed abundantly over posterior wall, beginning just above the trigone; do not follow crests of rugae. Mucosa itself is smooth, nowhere ulcerated or covered with fibrinous exudate. Mucosa everywhere strikingly edematous.

Rectum: Mucosa blood stained.

Organs of neck and pharynx, brain, adrenals, pancreas, thyroids and mesenteric lymph nodes show nothing of importance.

Stomach: Slaty discoloration of mucosa. Some fresh, small hemorrhages.

Intestinal tract: Also some scattered areas of hemorrhage into mucosa; no ulcers or other inflammatory changes.

Microscopic notes: Lung: Alveoli filled with exudate, fibrin, red blood cells, polynuclears and desquamated alveolar cells. In some areas red cells predominate, giving frankly hemorrhagic character to pneumonia. In areas of most extensive hemorrhage, alveolar walls disrupted. Consolidation patchy, but quite extensive.

Liver: Marked edema of liver cells, tissue between them and capillary walls.

Spleen: Shows nothing of importance, except considerable intracellular brown pigment.

Kidney: Most of glomeruli show free blood in capsular space. Tufts are collapsed, and contain very few red blood cells. Entire absence of any acute inflammatory change in glomeruli. Number of leucocytes not increased, nor is there any exudate apart from hemorrhage into the capsular space. Lining of Bowman's capsule for the most part normal. In a few of the tufts, epithelial cells seem to have grown over the mass of conglomerate red blood corpuscles. Outlines of tuft capillaries are rendered somewhat indistinct by hyaline swelling of capillary walls. Proximal convoluted tubules are lined with high columnar epithelium, excellently preserved, differing from normal not only in shape, but in the presence of large numbers of hypertrophic nuclei, lobate and frequently having the appearance of amitotic division. Distinct mitotic

figures not found. Tubules, almost without exception are filled with well preserved red blood corpuscles, and variable numbers of desquamated epithelial cells and occasionally a leucocyte or small lymphoid cell. Remainder of tubular system shows excellent preservation of epithelium in collecting tubules: Red cells found in the tubules are loose, well preserved, forming pink-staining, granular masses, in which individual corpuscles are not easily recognized. Few of tubules also contain casts mixed with blood pigment. Interstitial tissue is definitely increased in amount. Tubules rarely in apposition, but separated from one another by rather edematous fibrous tissue, which contains lymphoid and plasma cells, for the most part sparsely distributed, but in a few places forming a rather dense accumulation. There are also scattered pigment-containing cells. There is, however, very little, if any, hemorrhage into the interstitial tissue. The arteries show no sclerotic change or any other distinct lesion.

Bladder: Section through the bladder wall shows an intact mucosa. There is a loose edema of the submucous tissue, with a sparse infiltration of mononuclear cells.

Section of bladder wall (through hemorrhage) taken from specimen preserved in Jores: the epithelium is missing over the entire section (artifact). The submucous cellular tissue is extremely edematous. There is an extensive hemorrhage into the superficial portion of loose cellular tissue. Although there are occasional lymphocytes among the red blood cells, the lesion does not appear to be an inflammatory one. Two small lymph follicles are included in the section. The muscular coat shows no change.

Heart: Section through wall of auricle in region of hemorrhage shows an acute necrotic and suppurative process with no effort at repair. Extreme fragmentation of nuclei of leucocytes. These nuclear fragments and red blood cells extend in strands between muscle bundles on the surface. Lifting up the still intact row of epicardial cells is an exudate rich in fibrin. Muscle fibers show more degeneration, having lost their striations; many of them are necrotic. Section through the ventricle shows marked fragmentation of muscle, but no inflammatory changes.

Aorta: Section through plaque in first portion of aorta shows typical syphilitic aortitis.

SURGERY OF THE GENITO-URINARY TRACT OBSERVED ABROAD AS CONSULTANT IN UROLOGY, BASE SECTION 2, FRANCE

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In this presentation I shall not attempt to do more than to give general impressions, personal experiences and to report, more or less in detail some of the cases seen of which I made notes at the time. As chief of the Urological Service and assistant to the chief of the surgical service in Base Hospital 6, and later as Consultant in Urology to Base Section 2, I had an excellent opportunity to observe a large number of wounded.

Base Hospital 6 went abroad in July, 1917, and was ordered to take over a large French hospital near the city of Bordeaux. The transfer was effected about September 1 of that year. During the months that followed many additions and improvements were made and much new construction undertaken and pushed as rapidly as possible and completed none too soon for the rush which began in the following spring and continued until after the armistice.

The hospital rapidly expanded from a few hundred beds to about 4500 in that time. More than 30,000 patients were cared for. Of this there were 23,000 battle casualties.

The Surgical Division handled about 21,000 patients; in this are included a small number, in proportion of cases, of acute civil surgery, such as acute appendicitis, operations for empyema, traumatisms, etc. The remainder of the battle casualties were gassed cases. As Urologist to the hospital I had charge of all the urological cases. These included diseases and injuries of a civil as well as of a military nature.

Of the former it may be well to state here, that no cases of uncomplicated venereal disease were admitted to base hospitals,

they being treated in regimental infirmaries, camp hospitals and venereal camps. Of the complications a large number of cases of gonorrheal epididymitis were treated almost invariably by operation with uniformly good results. A few cases of epididymitis occurring with spinal meningitis were observed. Gonorrheal arthritis was treated in conjunction with the Orthopedic Department. Some of these arthritic cases were very severe. I recall two or three very bad infections of the knee joint which did remarkably well after simple aspirations of the joint with a large trocar and irrigated with hot sterile water.

Some of the chancroidal lesions were really terrific and required hospitalization. In some case there was entire destruction of the glans penis, in some, partial destruction of the shaft, and in others extensive involvement of the inguinal and suprapubic regions.

Stricture of the urethra, retention of urine, severe prostatitis, prostatic abscess, and other suppurations were met with and treated by the ordinary surgical methods.

A number of severe traumatisms of the genito-urinary tract were seen, including a rupture of the kidney, which made a good recovery without operation. Several cases of rupture of the urethra, severe blows in the perineum, fractures of the pelvis, etc. A number of cystoscopic examinations were made for the medical department for various lesions. Cases of lithiasis and renal and genital tuberculosis were referred to the Disability Board for duty in the Service of Supply or return to the United States. Some of these first received operative treatment.

It may be stated that in the Army, the specialties of Syphilis and Dermatology were included under the Department of Urology. In our hospital all such cases were most ably taken care of by Doctor, then Major, E. L. Oliver, of Boston.

In June, 1918, I was appointed Consultant in Urology for Base Section 2, my work being outlined as follows:

> In addition to other duties to make visits to the various base hospitals and camp infirmaries in this section for the purpose of seeing cases of war and civil injuries of a urogical nature.

There were several other Base Hospitals in section 2, including the large hospital center at Beau Desert of about 10,000 beds, as well as a number of camp infirmaries. This gave me the opportunity to see a number of interesting cases and to have such as I might think advisable transferred to my own service at Base Hospital 6.

I should like to take this opportunity to express my appreciation and thanks to the commanding officers and ward surgeons with whom I came in contact at the various hospitals and infirmaries for their courtesy and coöperation.

Because of the pressure and stress of work in the Surgical Department in the spring and summer of 1918 I had a good deal of general surgery in addition to the strictly urological work, at one time having 220 beds.

I had one ward however, in which all wounds of the genito-urinary tract were segregated as far as possible. These were distinct from the venereal complications which were treated in the venereal ward.

This ward was the nucleus of what undoubtedly later would have developed into a "Center" in this area for wounds of the genito-urinary tract, had the war continued. It being the plan of the urological department of the army to collect all such cases in various "Centers" as early as possible under the care of a genito-urinary surgeon with the necessary equipment and specially trained nurses and orderlies so essential for this type of work.

In a recent paper by Dr. A. R. Stevens of New York, he calls attention to the relatively small number of wounds of the genito-urinary tract observed in Base Hospitals abroad. His experience is entirely borne out by my own.

I regret that I am unable to give any definite figures or percentage of the number of cases of this type in our hospital, nor do I know whether any such are available at present. Statistics went by the board during the rush. Patients were evacuated from the hospital for return to the United States or to other hospitals and convalescence camps when they were able to go, with great rapidity, to make room for new arrivals, and the numbers were lost sight of.

This much I can state that the genito-urinary war wounds were relatively few in number. This is particularly true of the wounds of the upper tract. Wounds of the bladder and the urethra were more common, as a rule very severe, prone to complications and requiring much care. And in a number of cases the end result unsatisfactory, distressing, and disabling from urinary fistulae, stricture, permanent perineal urethra, etc., requiring continual treatment or further surgical intervention. This is particularly true of wounds of the perineum with fracture of the pelvis and injury to the urethra. I saw a number of such cases.

Wounds of the external genitals were, I should think, more frequently met with. I shall speak of them later.

In my observation, wounds of the genito-urinary tract rarely occurred alone, being nearly always associated with other wounds. They fell roughly into two classes, the distinction being one of degree only.

One class where there were multiple wounds from a number of shell fragments, some portion of the genito-urinary tract being involved in the general damage. Such cases were very severe and the mortality very high.

The following case will serve as sufficient to illustrate this type:

J. S., Private, Company B, 344th Machine Gun Battalion.

Gun shot wound. Multiple. Severe. Received I. A. (in action) October 15, 1918.

Head, penetrating. Right forearm, penetrating. Right thigh, penetrating.

Genitals lacerated.

Entered Base Hospital 6, November 1, 1918.

Seen in consultation with Ward Surgeon.

Transferred to Urological Service.

Examination:

1. Gun shot wound head. Wound mid-occipital region, 2 inches long. Infected. Sutures cutting. Bare bone but no fracture.

2. Gun shot wound right forearm. Circular amputation, junction middle and lower third. Wound clean and granulating.

3. Gun shot wound right thigh. Large "dèbridement," wound 12 by 3 inches. Anterior aspect right thigh, clean and granulating.

4. Gun shot wound lacerated, genitals. Shaft of penis and skin anterior surface of scrotum gangrenous and sloughing. Both testicles exposed but apparently uninjured.

5. Operation wound suprapubic cystotomy. Suprapubic tube.

The suprapubic tube was not draining satisfactorily and the dressings were urine soaked. A large catheter was put in its place which drained well and kept him perfectly dry. The genital and other wounds improved a good deal under careful dressings, nothing further being attempted or indicated.

This man suffered greatly, exhibited unlimited grit and put up a good fight, but the general condition was poor and he died seventeen days after entrance from exhaustion and septic absorption. There was a terminal bronchopneumonia.

The other type being where some one organ as the kidney, bladder or urethra, was injured by a single fragment or a through and through perforation by a machine gun bullet. These were almost always accompanied by a perforating wound of the hip, buttocks or thigh.

It is to be remembered that I am speaking of conditions in Base Hospitals and that all these patients, or practically all, had received their first operative treatment elsewhere, so that any discussion of the immediate treatment of such wounds is out of place here. I shall confine myself to reporting the cases as they came to us or were seen in consultation at other hospitals, anywhere from thirty hours to several weeks after being wounded or having their first "dèbridement."

WOUNDS OF THE KIDNEY

These were very few in number. I personally know of only three that were in our hospital. One of these, while not a battle casualty, presents certain points of interest which warrant its being reported.

It can be easily understood that a severe wound of the kidney would cause death from hemorrhage before any surgical aid could be given. This, undoubtedly, accounts in a large part for the rarity of these cases, not only in the Base but in the Evacuation Hospitals as well, which has been the experience of a number of

surgeons I have talked with who had served many months in front line hospitals. Stevens has quoted some groups of statistics which show injury to the kidney in from 4 to 9 per cent of all perforating abdominal wounds.

It may be of interest to note here that perforating abdominal wounds were likewise very uncommon in our hospital. I only recall a few.

Of the three kidney cases, one patient showed a clean, partially sutured wound in the left loin. The "Field Card" stated there had been an injury to the lower pole of the left kidney. There were no symptoms, the urine was negative. He made an uninterrupted recovery.

In the second, there had been an injury to the spine and a nephrectomy for hemorrhage.

Brief extracts from the "Field Card" as follows:

R. H., Sergeant, Company F, 355th Infantry.

Gun shot wound back (left kidney). Received in action, October 21.

Evacuation Hospital 10: Through and through wound back. Wound of entrance left host axillary line. Wound of exit right post axillary line. Urinary retention, catheter showed blood in urine.

Base Hospital 15: "During night of October 27, severe hemorrhage into bladder. Patient became pulseless. Salt solution infusion. Cystoscopy showed bleeding from left kidney. Left lumbar nephrectomy, suprapubic drainage of bladder."

December 15, 1918, Base Hospital 6: Seen in consultation with ward surgeon. Gun shot wound back perforating. Left post axillary line to right back. Nephrectomy wound left loin. Suprapubic wound. Bed sore. Paralysis below waist line. Bladder satisfactorily drained by putting large catheter in place of suprapubic tube.

This case was of interest in that the severe hemorrhage from the kidney occurred a week after being wounded. It is also interesting to note that the paralysis was improving while he was waiting for evacuation to the United States. He was able to move his legs and had rectal control. He was still in the hospital when I left February 14, 1919.

The third case was treated throughout in Base Hospital 6.

R. S., Private, Battalion D, 17th Field Artillery.

Gun shot wound perforating, left upper arm.

Gun shot wound perforating left chest to left back.

Brought to Base Hospital 6, November 8, 1918, at 10 p.m.

History of having been shot by a Military Policeman three hours before while resisting arrest.

Examination: Gun shot wound perforating left upper arm.

External aspect, no fracture.

Gun shot wound chest. Wound of entrance left axillary line between 7th and 8th ribs. Wound of exit to left of spine level of 3d and 4th lumbar vertebrae.

Condition good. Wounds cleaned. No evidence of intraabdominal injury.

Slight haematuria for the next two days.

November 24 (sixteen days after being shot). Seen in consultation with Ward Surgeon for recurrence of haematuria. Urine dark with clots. Abdomen negative. Flanks negative. Wounds healed with dry scabs. Pulse 84. Condition good. Observation.

Transferred to Urological Service.

November 26. In late afternoon patient had a retention of urine from clots. Taken to operating room. Clots washed out of bladder through a large evacuating tube. Condition good. Color good. Pulse normal.

November 27. Cystoscopy after washing out some old clots showed slightly blood tinged efflux from left ureter, urine from right kidney slightly cloudy. Sediment showed a little pus microscopically. No. 6 ureter catheter was tight. No. 5 passed.

December 2. Condition good. Some pain in loin. Temperature 99.4°.

December 7 (thirty days after injury). No symptoms until suddenly at 7 p.m. urgent desire to micturate. Passed two urinals full of fresh blood. Bladder distended, unable to void more. Patient blanched. Pulse 110. Taken at once to operating room. Ether. Left lumbar nephrectomy. (Major O'Neil and Lieutenant Clark). Fat capsule thickened. Kidney very adherent. Some broken down material at lower pole of kidney. (Beginning perirenal abscess?) Considerable bleeding during operation. Wound sutured with drain. Sixteen ounces of salt solution given intravenously. Blood typed.

Found to be Group 4. Donor found. 500 cc. of citrated blood transfused by Major Lineback. Much clot washed from bladder. Condition after operation fair. Anti-tetanic serum 1500 units.

December 8. Urine clear. Condition good.

December 11. Wick removed. Temperature normal. Convalescence uneventful.

It is interesting to note that the severe hemorrhage occurred thirty days after the injury. The kidney showed a large through and through perforation opening into the lower calyx with considerable destruction of the lower pole, There was infection with the subsequent erosion of a good sized blood vessel.

No wounds of the ureter were observed.

WOUNDS OF THE BLADDER

According to the statistics before quoted bladder injuries occur in from 4 to 7 per cent of all perforating abdominal wounds. I will give brief notes on three cases all of which were associated with wounds of the buttocks.

R. E. F., Corporal, Company G, 137th Infantry.

Gun shot wound, perforating. Machine gun bullet lower abdomen to right buttock. Injury to bladder. Received in action September 29, 1918.

Seen in consultation Base Hospital 114.

Entrance Base Hospital 114 October 8, 1918. No primary operation. Wound of entrance just above symphasis pubis leaking urine. Wound of exit right buttock. No fracture of pelvis. Constant drainage catheter. Suprapubic sinus closed in two weeks. Good control of urine. No obstruction in urethra.

Another case:

M. J. D., Sergeant, Company E, 139th Infantry.

Gun shot wound, perforating. Machine gun bullet lower abdomen to left buttock. Perforation of bladder and rectum. Received in action September 27, 1919. "Dèbridement," suprapubic drainage of bladder.

Entered Base Hospital 6, October 11, 1918.

Seen in consultation with Ward Surgeon.

Transferred to Urological Service.

Granulating wound in suprapubic region, leaking urine. Wound in left buttock which discharges gas and feces. Put on constant urethral drainage. Suprapubic sinus closed in two weeks. Abdomen wound healed promptly. From time to time foul smelling discharge from sinus in buttock, which is becoming much less. X-ray negative for foreign body. Transfer to the United States.

The third case, a perforating wound of the buttock and bladder had a haematuria. Cystoscopy showed a healing wound above and to the outside of the right ureter.

WOUNDS OF THE SPERMATIC CORD

I only observed one such and the following case is reported for that reason.

J. H., Private, H. Q. (Headquarters) Company 104th Infantry.

Gun shot wound, perforating right buttocks to right groin.

Received in action October 29, 1918, 9 p.m. Operation "debridement" same night.

Entered Base Hospital 6, November 1, 1918.

November 19. Seen in consultation with Ward Surgeon for swelling of scrotum.

Transferred to Urological Service.

Examination: Wound of entrance right buttock. Wound of exit right groin. Both infected. Right spermatic cord thickened. Right side of scrotum enlarged and fluctuant. Patient running high irregular temperature. Diagnosis: Wound of cord, secondary abscess of scrotum. Incised, local anesthesia, much pus evacuated. Testicle covered with slough but was left.

December 3. Wound of groin and scrotum healed. Some induration in buttock.

December 6. Secondary abscess of buttock opened, connected by through and through drain with original buttock wound. Convalescence slow.

WOUNDS OF THE PERINEUM INVOLVING THE URETHRA

These were, as a rule, severe and troublesome cases, often complicated by fracture of the rami of the pelvis and almost invariably accompanied by perforating wounds of the thigh, buttocks or groin. It is in this type of case that one meets with the disastrous end results already referred to, of fistulae, lack of urinary control, and permanent perineal urethrae. I have selected the following cases as examples:

Notes from "Field Card:"

E. G., Private, Company E, 39th Infantry.

Gun shot wound perforating suprapubic and perineum. Injury to urethra.

Gun shot wound penetrating inner aspect both thighs.

Gun shot wound penetrating left ankle.

Gun shot fracture symphasis pubics.

Received in action August 5.

August 6. "Dèbridement." Suprapubic cystotomy. External urethrotomyta—tempted reconstruction of urethra.

August 14. Suprapubic tube out.

August 18. All urine through perineal tube.

Entered Base Hospital 6, August 21, Urological Service.

Examination: Small suprapubic wound discharging small amount of serum. Large granulating perineal wound with drainage tube to bladder. Granulating wound inner aspect both thighs and granulating wound left ankle. Nothing could be passed through urethra. All instruments came up against a solid obstruction.

September 21. All wounds clean and healing. All urine by perineum. Had control.

Transferred to Base Hospital 8 for evacuation to United States. Fracture of pelvis.

In the next bed at the same time was an almost similar case except that he had in addition a wound of the penis resulting in the loss of the left corpora cavernosa and a wound of the scrotum, involving the loss of the left testicle. He entered Base Hospital 6, Urological Service, the same day and was evacuated to Base Hospital 8, the same day. "All urine by perineum. Had control."

In the two following very similar cases there was a much happier result.

G. P. R., Private, Company G, 58th Infantry.

Gun shot wound perforating left hip to right buttock. Machine gun bullet. Injury to the urethra, urinary fistula left hip. Fracture of pelvis.

Received in action July 18, 1918.

July 19. "Dèbridement" of wounds. Entered Base Hospital 6, July 29, Urological Service.

Examination: Granulating wound left hip. Leaking urine. Granulating wound right buttock. X-ray showed fracture descending ramus of right ischium. After a good deal of patience, a silver catheter was passed into bladder. This was followed by a soft rubber catheter with a stylet, put on constant drainage.

September 21. Catheter has been out for ten days. No leaking from sinus in left hip since catheter was introduced. Has good control. Wounds clean and healing. Transferred to Base Hospital 8 for evacuation to United States. Fracture of pelvis.

F. N., Second Lieutenant, 113th Infantry.

Seen in consultation Base Hospital 114 on October 31, 1918.

Gun shot wound, penetrating. Machine gun bullet. Inner aspect right thigh abrasion right scrotum traversing perineum. Exit left groin. Urinary fistulae perineum and left groin. Some urine passed through urethra. Operation "dèbridement," October 16, 1918. Put on constant urethral drainage four days later. Catheter in place for five days. No leaking since. None today. Passed 8 ounces. Good control. Wounds clean and granulating. To have dilatation with sounds.

The result obtained in the following case was of a good deal of satisfaction to me as it was an unpromising looking proposition, there being a urinary fistula of the left groin.

Notes from "Field Card:"

J. E., Private, Company I, 26th Infantry.

Gun shot wound perforating. Laceration of left side of scrotum. Injury to urethra.

Gun shot wound penetrating right thigh.

Received in action October 9, 1919.

October 10. Operation "dèbridement" of wounds. Removal of left testicle. (Urethra had been sutured over a catheter. This was done through the lateral wound of the scrotum.) Foreign body removed from right thigh.

Transferred from Base Hospital 114 to Base Hospital 6.

Urological Service November 12, 1918.

Examination: General condition poor, color poor. Normal temperature. Left testicle absent. Irregular granulating wound left groin extending to left scrotal fold through which all urine runs. Granulating wound inner aspect right thigh and right buttock. Back ulcerated. Nothing could be passed into bladder, all instruments held up about 4 inches from meatus.

He stated the catheter came out a short time after operation and all attempts to get it back failed. He was continually wet, having no control. Incontinence of retention. The dressings were changed almost continuously and much credit is due to the nurse who practically "specialed" him. After a week the condition of the skin and back had improved greatly and I decided to explore him.

November 18 (forty days after injury). Ether. A filliform passed into the sinus in the groin apparently entered the bladder. An incision was then made in the perineum and the urethra found to have been drawn high up to the left by cicatrical contraction, sharply angulated with an opening at the apex. The urethra was entirely freed, the strictured area resected longitudinally and sutured transversely over a catheter passed through the urethra into the bladder. Anti-tetanic serum 1500 units. The catheter drained well, the sinus ceased to leak. The improvement in the general condition was marked and immediate.

The catheter was kept in place for two to three weeks requiring frequent changing as there was a marked tendency to incrustation.

During convalescence he had two attacks of pyelitis with high temperature and tenderness, first over the right, then over the left kidney. The catheter was replaced during these attacks. The last note states he was up and about, had good control. He had been having dilatation with sounds up to 23 French at intervals. The urine was slightly cloudy, albumin trace. The general condition much improved. Other wound healing slowly. To be transferred to the United States.

Two other cases in this class are as follows:

The first is of interest as it did not seem possible that so favorable a result could occur. The patient had a very large "debrided" wound of

the perineum involving the anus, from which urine and feces were being constantly discharged. He was seen in consultation with the Ward Surgeon, October 17, 1918, but remained on the General Surgical Service. A catheter was fastened in the urethra for ten days after which time there was no urinary leaking. Discharged to the United States on December 8, 1918. Wound not healed. Some incontinence of feces.

The second case was also a satisfactory one. Seen in consultation Base Hospital 114, October 2, 1918.

A. C., Bugler, Company I, 11th Infantry.

Gun shot wound perforating right scrotum and urethra. Received in action September 12, 1918.

Operation "dèbridement." Removal of right testicle, and suprapubic drainage. Patient had been etherized a few days before I saw him at Base Hospital 114 and put on constant urethral drainage. Catheter came out and could not be put back.

Examination: Suprapubic wound dirty and incrustated. Some infection of prevesical space. Some leaking about suprapubic tube. Granulating wound—right side of scrotum close to fold of groin, leaking urine. Nothing could be passed into bladder by urethra. Catheter on stylet passed through suprapublic wound into internal meatus. Catheter pushed down on stylet and appeared at external meatus another catheter sewed to it and pulled down into bladder. Put on constant drainage. Both wounds ceased to leak.

October 20. Discharged to the United States. Wounds not healed. No leaking. Good control. Some frequency. Bladder capacity fair. Fracture right ramus of pelvis.

I could cite other cases but these are sufficient illustrations of this type.

WOUNDS OF THE EXTERNAL GENITALS

It will be observed in some of the foregoing cases that wounds of the scrotal contents requiring the removal of one or both testicles were met with in connection with other wounds of the thigh, etc. Also at times plastic operations were necessary to cover in skin defects in the scrotum. These cases belong rather to the general than to the urological surgeon.

WOUNDS OF THE PENIS

A few wounds of the penile urethra were seen, accompanying through and through wounds of the thigh.

J. S., Private, Company D, 307th Infantry.
Seen in consultation Base Hospital 114, October 31, 1918.
Gun shot wound perforating penis and left scrotum.
Gun shot wound perforating left thigh.
Received in action September 14, 1918.
Base Hospital 114, September 24, 1918.
No urine from meatus. Came through fistulae in penis one on dorsum, the other to left of fraenum.
Examination: October 31, through and through wound of penis. Wound on dorsum healed. Wound to left of fraenum leaking. Urethra closing down. To have dilatation, urethrotomy if necessary.
Note: Two weeks later urethra had been dilated. Wound healed.
A similar case from Base Hospital 6:
W. L. B., Corporal, 111th Company, 167th Infantry.
Gun shot wound, perforating. (Machine gun bullet.) Penis, left scrotum and left thigh.
Received in action September 26, 1918.
Base Hospital 6, October 12, 1918.
Examination: Through and through wound of penis perforating urethra. Entrance dorsal surface back of coronal sulcus. Exit left of fraenum. Wound of scrotum. Left testicle absent. Wound inner aspect left thigh. Urine leaked from both wounds in penis.
November 20. Wounds of penis healed. No leaking. No stricture. Has been having dilatation. Transferred to the United States because of contraction of wound of thigh.

These cases will require intermittent dilatation the same as any traumatic stricture.

I saw one other case where there was a through and through machine gun bullet perforation of the penis which did not involve the urethra.

The following case differs from the others, requiring operative closure of the fistula. The result was perfect.

E. D. J., Private, Machine Gun Battalion, 26th Infantry.
Gun shot wound, right arm, perforating. Penis perforating. Scrotum lacerated. Right foot, perforating.

Received in action October 7, 1918.

Operation "dèbridement" of wounds.

Base Hospital 6, October 17. Seen in consultation with Ward Surgeon. Transferred to Urological Service.

Examination: Gun shot wound forearm, and dorsum right foot clean, nearly healed. Gun shot wound of penis, perforating. Wound of entrance through preputial opening penetrating prepuce at sulcus to left of fraenum. Exit shaft of penis about middle. Skin has been "dèbrided" from under surface of shaft of penis for about 2 inches from the base and from anterior surface of scrotum. There is an opening in the floor of the penile urethra at its middle about half an inch long through which all urine passes.

November 1. Culture from wound of penis showed no gas bacilli or streptococci. Ether. Plastic operation for closure of urethral fistula and repair of skin defect penis and scrotum. Bladder drained by catheter through small perineal wound.

November 10. Catheter out. Wound healed by first intention. No leaking.

November 16. Transferred to the United States because of wound in foot.

The mortality of the genito-urinary wounds is generally conceded to be high. That is undoubtedly true for reasons before stated, and accounts for the small number reaching hospitals. The mortality in Base Hospital 6 was "nil" except in cases of multiple severe injuries, and the results were, I think, as good as could have been expected.

I had no opportunity to try the "laissez faire" treatment in retention of urine due to paralysis in wounds of the spinal cord which is advocated by British surgeons. What cases I saw had been already subjected to suprapubic cystotomy or constant urethral drainage.

Such, in brief, were some of my observations and experiences with war surgery of the genito-urinary tract abroad.

But I think one of the most vivid impressions that remains is the cheerful courage and philosophy with which the doughboy "took his medicine." And this applies strongly to the class of cases just reported.

We had good material mentally and physically to work on.

In conclusion I apologize for this sketchy and unscientific presentation.

DISCUSSION

Dr. WILLIAM E. LOWER, Cleveland, Ohio: My experience bears out what Dr. O'Neil has said in regard to the infrequency of uncomplicated wounds of the genito-urinary tract. I had occasion to see a great many of these cases, both at the front and at the base, and recall but a very few in which the injury to the genito-urinary tract was not complicated by some other injury. For instance, an abdominal wound would coëxist with wounds of the kidney. Wounds which perforated the bladder nearly always involved the large gut, the rectum, and buttocks, also. In such cases no attempt was made to do a radical operation. We simply drained them and sent them down to the base. I afterwards saw many of these at the base and was surprised to see how well most of them turned out, even with only suprapubic drainage.

The external genitalia were frequently wounded, coincidently with wounds of the thigh. Often a wound of both thighs would involve the scrotum and testicles. Occasionally a wound of the thigh would involve a through and through wound of the penis. But in none of the cases did we try to do very much plastic work. We merely drained them and sent them on to the base. If they got as far as the base most of them recovered after rather prolonged draining. These cases were sent to Great Britain before any end results could be observed. I was behind the British lines and saw many cases of this kind among the British soldiers. It would take too long to discuss these cases in civil practice, that is, injuries of the urinary tract, but I may mention that since I have been home I have seen a number of cases, as I happen to be associated with a hospital which is located in a neighborhood where we get a great many automobile accidents. Ruptured kidneys are a frequent feature of these cases. When hematuria occurs in children or adults, our rule is to wait for either severe

hemorrhage, or some complication. The majority of cases get well without surgical intervention. It is necessary, however, to keep them in the hospital under observation so that if anything happens, they can be transfused or if necessary, the kidney can be removed. But the percentage in which intervention is required is very small indeed.

I am sorry that I cannot discuss the paper of Dr. Stevens, but I want to express my appreciation of this very splendid piece of work, for which this organization is very greatly indebted.

Dr. V. D. LESPINASSE, Chicago, Ill.: I would like to discuss Dr. Stevens' paper. It has been my experience to have had a great deal to do with hemorrhagic disease, of all sorts and varieties, growing out of my blood vessel work that I did some ten or twelve years ago, but this type of purpura that involves the bladder and kidney is unique as regards the ordinary classes of hemorrhagic disease. Of course, the group of hemorrhagic diseases includes a vast number of clinical conditions, the chief and only point of similarity with many of them is the hemorrhage. The condition in babies is one that lends itself to etiologic discussion a little better than some of the others. There are two types of cases there, one with fever and one without fever, and in my mind, at least, I have associated the fever type of cases with infection. There are some more or less contagious, that occur in groups. About four months ago I had two patients, the children of two women, total strangers, who had the same room, a double room, in the hospital, and their babies when born, were both hemorrhagic. The afebrile type of cases we have considered as due to some temporary disturbance in the function of the liver. These patients Dr. Stevens observed might be classed as some variety or species of scurvy, or something of that order. Men whose dietary régime has been changed, and who have been under stress and strain, have a predisposition to infection, or to an occult change in the blood, that makes them bleed. The picture of the kidney that Dr. Stevens showed is an exact reproduction of a picture that I have reproduced experimentally by transfusing non-

miscible bloods. This picture of hemorrhage also occurs in the liver, and in the spleen, and I would just like to know if in this particular autopsy his spleen and liver showed any hemorrhage.

Clinically I saw four or five years ago a woman, she was an insane woman (her general condition was extremely bad), with one of the depressive types of insanity, that had hemorrhage from her bladder. Her bladder showed these small hemorrhagic spots. At that time I was unable to explain the condition, as in my experience it was unique, and this paper just recalled it to mind.

Dr. O'Neil mentioned the fact of hemorrhage from the kidney, and the treatment by transfusion. I think many patients, at least in my observation, have been allowed to die from severe hemorrhages from the kidney without transfusion being attempted. I think transfusion of blood should be done on these patients who have severe kidney or bladder hemorrhage much oftener than it is.

Dr. E. L. YOUNG, Jr., Boston, Mass.: I want to speak in connection with Dr. Stevens' paper, of a case I saw last year. It is known that purpuric manifestations of the skin can occur in connection with infections with the streptococcus hemolyticus. When I saw the case, supposed to be one of chronic pulmonary tuberculosis, with partial destruction of the right apex, he was having considerable hematuria. The cystoscopic picture was one of multiple hemorrhagic areas. I had permission to follow the man, and we worked out the fact that instead of having chronic tuberculosis, which was the diagnosis in the country, he had a chronic influenza, associated with streptococcus infection. Both organisms were demonstrated. Although we did not demonstrate any of the organisms in the bladder, it seemed reasonable to assume that the hemorrhage was from these purpuric areas in the bladder, the etiology being the same as for the purpuric spots which have been noted in some infection in the skin.

Capt. J. PETERS, Jr., New York, N. Y.: The remarks that have already been made in the discussion are rather interesting, because we have to a certain extent foreseen them. The relation of this condition to other purpuric conditions is interesting. We cannot distinguish any special lesions from the purpuric lesions that may occur in any type of purpura but it is striking that out of some thousands of admissions to Base Hospital No. 2, at least 16,000 in the time we were there, we only saw two other cases of purpura, and one of these other cases also may have been similar to the cases here reported. That is, he started with a marked hematuria and afterwards developed general purpura. He was a very sick man. He finally recovered. But it was at the time when we were evacuating very rapidly to England, and we were unable to investigate his urinary tract.

The only other case of purpura I saw was a case of Schoulein's purpura.

In regard to the question of scurvy: In the first place, scurvy was very rare. In none of the other admissions did we see any manifestations of scurvy. Again one would have to conceive of a scurvy confined entirely to the urinary tract. In the second place, one of our own men developed this disease. His dietetic conditions were excellent. There was no shortage of green vegetables, no shortage of any antiscorbutic substances in the diet of our men. We were in Normandy, with all kinds of vegetables, and in fact, it was very hard to keep the men from eating too many of them, because they went around to the farm and picked up anything they wanted. The streptococcus infections, of course, we considered. We thought these cases looked very much like streptococcus infections. One case had a blood culture with one colony of streptococcus not hemolytic, in one culture medium. We could not recover the streptococcus in that case again, and it seems that this must be accepted as a contamination.

The important thing at this time is not that this is a war disease, because the war is over, but that it may very well occur in civil life. The thing that interested me most was that we would not have found these cases unless the clinical

man had been working with the genito-urinary surgeon. This is brought out most strikingly by the fact that only 50 per cent of these cases came in with a diagnosis of acute nephritis. Most of them came in with every conceivable diagnosis, but especially renal calculus, ureteral calculus, and vesical calculus, and it was through a case that was set down as ureteral and vesical calculus that got out first lead.

Dr. JAMES PEDERSEN, New York, N. Y.: Would poisoning by the fumes of T. N. T. account for any of Dr. Stevens' cases? The occurrence of such poisoning among the workers in munition factories has been well recognized, and has been definitely recorded in the literature. A case came under my observation in which the symptoms were identical with those that occurred in Dr. Stevens' cases. There were frequency of urination and hematuria; the cystoscope showed the sub-mucous hemorrhagic spots. My chance to study the case fully was spoiled by the fact that, unfortunately, my patient was in the subsiding stage of his disease when he was referred to me; all the symptoms cleared up in about two weeks.

Dr. A. H. CROSBIE, Boston, Mass.: I would like to ask Dr. O'Neil, in a case in which he did nephrectomy for secondary hemorrhage, if it might not have been possible to have saved the kidney by doing nephrotomy, thereby giving clean drainage to it, and possibly saving the kidney?

Dr. A. R. STEVENS (closing): We were looking, of course, all the while, for some cause for this thing. The possibility of it being a type of trench fever was considered, but this was thought improbable, as already stated; and the possibility of it being caused by some chemical agent was also borne in mind. But against the latter etiology is the fact that, as Dr. Peters has already remarked, we had a typical case of this condition occur in one of the men of our own organization, who had never been up in the front area, never heard a gun fired, as far as we know. The patients came from all branches of the service. I did not

bring that out. A great many of them were men who had not done the front line work, but were in the artillery, and on the lines of communication.

Dr. R. F. O'Neil (closing): Answering Dr. Crosbie's question first in regard to performing nephrotomy in the case of hemorrhage from the kidney, I do not think it would have been wise. The lower pole of the kidney was pretty well destroyed by a large through and through perforation, the kidney was infected and there would have been danger of another hemorrhage which the patient could not have stood.

I was very much interested in Dr. Stevens' paper. I heard the preliminary report in Paris. We had no such cases in our service, or if we did they got by. We had a number of cases referred from the Medical Service with symptoms of ureteral calculus, but they practically all proved to be negative on urine examination and cystoscopy. I had several cases bearing out what Dr. Lower has said about injuries to the kidney in civil practice. One instance where a man had received a severe blow in the loin from a heavy swinging crane with undoubted rupture or tear of the kidney, did perfectly well without surgical intervention. It is good surgery to watch these cases provided one has the means at hand to interfere if necessary.

We had many secondary hemorrhages in which transfusion was successfully employed.

INFECTIONS OF THE GENITO-URINARY TRACT COMPLICATING INFLUENZA

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Medical literature for the past nine months has been flooded with reports and statistics relative to the influenza epidemic which has spread throughout this country and abroad. Complications involving the respiratory, circulatory and nervous systems have been recorded in large numbers, but little has been reported concerning the genito-urinary tract.

One brief report (1) of four cases of focal infection of this tract is the sole contribution to date, other than references to the kidneys from a purely medical standpoint.

A comprehensive review of the literature of the recent pandemic as it occurred in Europe is given in the medical supplement of the Daily Review of the Foreign Press, for March, 1918.

It is here stated that influenza recurs every twenty to thirty years in explosive waves spreading through whole continents, and that although twenty-seven years elapsed since the last pandemic, there has been neither an intelligent anticipation of the event nor certainty as to the true nature of the gigantic outbreak when it appeared.

A disease which causes such inroads upon the community should certainly be studied in all its phases if similar outbreaks in the future are to be anticipated and a better knowledge gained of the complications and their management when these occur.

The teaching of the Pfeiffer school, that the Pfeiffer B. influenzae is the causative organism, and that the various non-Pfeiffer epidemics were not true influenza, was upset when Stephan, in August, 1917, described a diplococcus mucosus as the agent of a clinically typical endemic of influenza which broke out in De-

cember, 1916, in Strümpell's clinic at Leipsic. It is not necessary here to trace the subsequent bacteriological history of this protean disease. It is safe to say, however, that the entry of various cocci into the bacteriological arena will more and more direct attention to complications and sequelae other than those affecting the respiratory system. It is in this connection that attention may be drawn to involvement of the genito-urinary system and clinical observations reported.

Medical reports mention a general hyperemic condition of the kidneys.

Blanton, Burhans and Hunter (2) hold that it is impossible to divorce a discussion of streptococcic infection from such antecedent diseases as influenza, measles, and upper respiratory inflammations. Among other localizations of streptococci, these writers mention abscesses of the kidney.

Bradbury and Krumbhaar, in 28 autopsies at No. 16 (Philadelphia, U. S. A.) General Hospital, out of 533 cases of influenza, representing the height of the epidemic in that locality, found abscesses in the kidneys in two, among other lesions representing a general pyemia. The kidneys in other cases at autopsy showed marked congestion.

Sofrè, of Naples (3), in summing up the principal features of the epidemic, gives severe acute nephritis as a constant finding in fatal cases.

Dalimier (4) found, in systematic daily examination of the urine, the presence of a large quantity of albumin in a high percentage of cases quite distinct from febrile albuminuria. He has seen numerous instances of acute and even hyperacute uremia in such cases, and is inclined to believe that the cases of acute edema of the lung recorded by Ravaut (5) were really examples of this kind.

A large number of cases of acute nephritis with well marked edema and dropsy among soldiers from the front, and also among civilians, have recently been studied by Dünner and Pupko (6). As the cases were observed during an outbreak of influenza, this disease suggested itself to the writers as the cause of the nephritis. In all the cases the patient's serum agglutinated B. influenzae in

1 in 200 to 1 in 400. The influenzal etiology of the nephritis was rather supported by (1) its occurrence during an epidemic; (2) the exclusion of other wellknown causes of nephritis; (3) the fact that the nephritis was recent, and not a recrudescence of an old process.

Lichtenstern (7) observed 15 cases of vesical hemorrhage which occurred on the third or fourth day of the disease, lasted on the average three or four days, and slowly subsided. Examination of the bladder showed considerable swelling and injection of the vesical mucous membrane, apparently due to subepithelial ecchymoses. The amount of the hemorrhage was usually very great. In one case severe hemorrhage occurred on the second day, and it was necessary to plug the bladder. In three cases well-marked diminution in the urinary secretion took place, and was accompanied by severe pain in both loins. These symptoms lasted for twenty-four hours, and then the amount of urine gradually increased. In two cases unilateral pyelitis developed.

Stengel (8) states that renal complications were apparently infrequent in the epidemic of 1889–1890. No figures could be given as to the frequency of albuminuria and cylindruria, but it is quite certain that very few cases of actual nephritis developed. In the pandemic of 1918 albumin and casts were very commonly found in the urine, and seemed to Stengel to be of little significance except when they were accompanied by other evidence indicative of nephritis. A few cases of acute hemorrhagic nephritis with pronounced uremic symptoms were observed in the series studied.

Of 62 urinary examinations made fairly early, Ely, Lloyd, Hitchcock and Mickson (9) found that 26 showed albuminuria and hyaline and granular casts; 7 showed albumin only, and 29 were normal. The kidneys, at autopsy, were found enlarged and congested, an edematous condition frequently being found about the suprarenals.

In a clinical study of influenza pneumonia Adolphus D. Rood (10) found that the kidneys presented nothing worthy of special note on macroscopical examination. Most cases showed the urine of atoxic parenchymatous nephritis. The specific gravity

was raised from 1020 to 1025 or 1035, varying with its concentration. Albumin was found in nearly every case, and varied from a slight trace to 30 per cent by volume, or even more. Rood considered its presence of prognostic value, although many patients recovered even with large amounts of albumin. Hyaline casts and cylindroids were present in varying amounts, but usually disappeared toward the end of lysis, or shortly after the temperature had reached normal. The presence of granular casts indicated that the patient was very seriously ill, and with few exceptions, when showers of granular casts were reported, the patient seldom recovered. It was striking to note how quickly the urinary picture cleared after toxic symptoms began to abate.

Riesman (11) considered it a striking feature of the majority of cases, both good and bad, in the recent epidemic in Philadelphia, that there was free diuresis, probably connected with the abundant water intake and fairly efficient kidney function. Albuminuria was commonly present; no more, however, than is seen in other acute infections. In a few cases a true hemorrhagic nephritis, with marked albuminuria, dark and light granular and cellular casts, and an abundance of free blood, was noted. Even in some of these the quantity of urine kept up very well. A not infrequent symptom, sometimes overlooked, was retention of urine with great distention of the bladder.

While the foregoing gives evidence that the kidneys in the severe cases are overwhelmed by the intense toxemia which is shown in other organs of the body, it is surprising that more local complications in the genito-urinary organs have not been recorded. It is possible that in the extremely severe cases the patient is so ill that the local signs or symptoms are masked or overlooked.

The changes, varying from acute congestion to renal hemorrhages and severe nephritis, certainly predispose to acute infection of the kidneys, and the fact that we have seen 39 cases of definite infectious foci in the genito-urinary tract makes us feel that these complications have been unrecognized and that careful histories taken in the future will disclose the starting point of many lesions in the influenza attack.

These 39 cases showed kidney infections in one or both kidneys in 22, perinephritic abscess in 5, prostatic abscess in 4, perinephritic and prostatic abscess in 1, epididymitis in 6, and seminal vesiculitis in 1.

KIDNEY INFECTIONS

The kidney infections were as follows: right pyelonephritis in 14, left pyelonephritis in 2, double pyelonephritis in 5, right pyonephrosis in 1. Nineteen of these cases were females, three were males. The ages were as follows:

Under 20	2
20–29	2
30–39	8
40–49	2
50–59	6
60–69	2
	22

Of these 22 patients 14 gave a history of no previous urinary symptoms.

Four of these 14 presented prolapsed kidneys which drained poorly, and two were pregnant. In 2 the right kidney was prolapsed and involved, in 2 others both kidneys were prolapsed and the infection was bilateral. All of the remaining 8 gave a history of pneumonia complicating the influenza, and were profoundly toxic.

The histories of the eight patients with previous urinary symptoms were interesting. In three patients a nephropexy had been done 12, 10, and 5 years previously. In each case there was a well-marked pyelonephritis in the same kidney, the opposite kidney not being involved, and in each case the kidney was low and in 2 freely movable, yet these patients stated that they had had no local discomfort since the operation until the attack of influenza. The fourth patient had a ureteral calculus, but no symptom of kidney infection until seized with the influenza. The fifth gave a history of two attacks of hematuria four and two years previously, and examination revealed polycystic kidneys.

The sixth gave a history of two attacks seven and three years previous to this one which were similar in every way and which were apparently attacks of pyelonephritis. The seventh had noticed frequency for eighteen years, but had no local kidney symptoms. The eighth gave a history of painless hematuria for eighteen months. A papilloma of the bladder was found. Four of these 8 cases gave a history of pneumonia.

These 22 patients with kidney infections were seen during the height of the influenza attack or as late as six months afterward. From observation and the histories of these cases, the symptoms indicating a kidney involvement came on from four days to two weeks after the onset of the influenza, the average being nine days.

The symptoms were pain and tenderness in the kidney region; frequent, burning, painful urination, except in 2 cases where the ureter on the affected side was occluded; high temperature, chills, malaise. In 13 cases one or both kidneys could be palpated at the time of the examination.

Cystoscopic examination and ureteral catheterization revealed a very much injected bladder; distinct ecchymoses in 6 cases, moderate congestion of the bladder mucosa in the others; poor drainage on the affected side in 8 of the unilateral cases; pus and blood cells from the affected kidney, in each case, from both kidneys in the bilateral infections; profuse hematuria in 2 cases, and deficient function on the affected side in each case. Nineteen cases showed casts in the urine.

Bacteriological examination of the catheterized specimen showed colon bacilli in 12 cases, staphylococci in 3, diplococci in 3, bacilli, reported as possible influenza, in 3.

The cases of pyelonephritis were treated by catheter drainage, pelvic lavage, diet, colonic irrigation, and urinary antiseptics. The acute symptoms subsided rapidly. The uncomplicated cases have been cured; the others are improved.

The case of pyonephrosis necessitated a nephrectomy, and the case of ureteral calculus had a primary carcinoma of the kidney which had previously given no symptoms. This kidney was removed.

PERINEPHRITIC ABSCESS

There were 5 cases of perinephritic abscess, one a female, four males. The ages of the patients were 14, 21, 24, 31, and 46 years.

The patients precenting perinephritic abscess were all distinctly septic, having had severe attacks of influenza. Of the 5 cases, 3 had had pneumonia, two had other septic foci.

These patients were seen from seven days to four weeks after the acute onset, and the local symptoms, pain in the side and back, tenderness in the lumbar region of the affected side, had persisted from five days to two weeks when first observed. Each patient had a persistent temperature, 3 had chills and in 4 there was distinct bulging in the flank.

One patient had frequency and painful urination. Cystoscopic examination and ureteral catheterization gave no definite renal lesion in any case other than the urinary changes in acute renal congestion.

Incision and drainage was made in each case. In one case no pus was found, but the symptoms subsided at once.

Cultures showed streptococci in 1, staphylococci in 1, colon bacilli in 1, possible influenza bacilli in 1.

All cases went on to complete recovery. This was slow in two cases owing to the septic condition of the patient.

PERINEPHRITIC AND PROSTATIC ABSCESS

A male patient, F. E., forty-eight, presented a perinephritic and a prostatic abscess. These foci were both well-marked upon his entrance into the hospital, four weeks after the onset of the influenza. His chief complaint, retention of urine, had been present for twenty-four hours. A large, boggy tender mass was present in the prostate. Pressure on this bulging mass per rectum caused pus to exude from the meatus. Influenza bacilli and staphylococci were reported in the pus. A second bulging mass was palpable in the left costo-vertebral angle. Both foci were drained. The convalescence was slow, owing to the poor condition of the patient.

PROSTATIC ABSCESS

Four patients presented prostatic abscesses. The ages of the patients were 32, 44, 47, 52. Two of these presented abscesses of large size, distinctly palpable per rectum, necessitating perineal incision and drainage; the other two presented one or more small foci distinctly palpable per rectum (suppurative prostatitis), which drained per urethram. These cases gave a history of the onset of the local symptoms 10, 13, 17, and 21 days after the onset on the influenza. Two had pneumonia. Influenza bacilli were reported in 1, staphylococci in 2, and there was no bacteriological report on the other. Two of these cases gave a history of gonorrheal infections eleven and fifteen years previously, but no urinary symptoms subsequent to that time until the onset of the present trouble. One developed a urethro-rectal fistula. All made good recoveries.

EPIDIDYMITIS

Acute epididymitis developed in 6 cases, from four to fourteen days after the onset of the acute influenza. The ages of the patients were 31, 36, 38, 44, 47, and 48. None of these cases had pneumonia or other complications. The epididymitis developed rapidly; the swelling became of large size, although not as large as gonorrheal epididymitis, it was painful, and subsided slowly; the urine became cloudy, showing pus, in two cases colon bacilli, in one staphylococci, and in one streptococci.

There was no venereal history of recent date, nor were there previous urinary symptoms in any of these patients.

SEMINAL VESICULITIS

A male, fifty-one years of age, developed violent frequency, tenesmus, and painful urination, three days after the onset of a severe attack of influenza. These symptoms persisted, and when I saw him, two weeks later, the physical and urological examinations were negative other than the presence of large, boggy seminal vesicles. The urine was clear until pressure was applied over

the vesicles, after which it became cloudy with pus. Colon bacilli were found in the expression. The condition was relieved by local treatment.

SUMMARY

These cases bear out the present understanding of the disease, namely, that the system of the infected individual is overwhelmed by a toxemia so severe that the resistance of the several organs is reduced, allowing various organisms to become active. The genitourinary tract is not an exception.

These cases demonstrate that kidneys once the seat of a lesion, or subject to interference with drainage, are more vulnerable when the individual is attacked by a severe infection. This should lead one to study the kidneys more carefully, favoring elimination, especially when they are known to be pathological.

Perinephritic abscess, prostatic abscess, and epididymitis may be a part of any hematogenous infection.

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DISCUSSION

Dr. WILLIAM F. BRAASCH, Rochester, Minn.: I would like to corroborate the observations of Dr. Bugbee with reference to the frequency of infection of the urinary tract, subsequent to influenza. The only way that the large increase of urinary infections noted in the past few months can be explained is by inferring that they occur as the result of influenza. The urinary infection usually occurs within a week or so following the height of the influenza infection. On cystoscopic examination it was found that the infection was confined to the bladder in the majority of the patients. The infection was probably originally a pyelonephritis in all cases, but at the time of the examination made several weeks after the onset of the infection, it remained only in the bladder. Although the infection is usually self-limited, the recovery can be heightened by the methods described by Dr. Bugbee.

Dr. ARTHUR L. CHUTE, Boston, Mass.: I should like to add a word to the discussion of Dr. Bugbee's paper: Perinephritic abscess has been in my experience a rare condition until the influenza epidemic appeared. During and following the epidemic I saw within three months six cases of this sort; more than I had seen in several years previously—all had had the influenza. Three of these cases I operated on and three of them were operated on by other men. In one case both sides were involved. All made good recoveries. In three of those cases cultures were made, in two, the staphylococcus albus was found, and in the other the staphylococcus aureus. I believe there was a definite connection between the perinephritic abscess and the attack of influenza.

Dr. W. C. QUINBY, Boston, Mass.: I would like to corroborate in just a word what Dr. Bugbee has said. In Boston we also

closed the hospital to all except influenza cases, admitting besides only an occasional surgical emergency, and it was very striking to see how the numbers of cases of infection of various portions of the urinary tract increased possibly three weeks to six weeks after the height of the epidemic. Of the more interesting manifestations of such infection I may mention two cases of epididymo-orchitis, the epididymis and the testicle itself being definitely involved in the infectious process; and several cases of late prostatitis, not going on to abscess, in patients previously free from prostate infection.

OPERATIVE TREATMENT OF SEMINAL VESICULITIS[1]

JOHN H. CUNNINGHAM

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During the past few years the value of surgical drainage of the seminal vesicles has become more generally appreciated, due in large measure to the conviction that many disturbances, especially in joints, are due to focal infection from which infectious emboli or toxins gain entrance into the circulation and produce metastatic disturbances in other quite remote structures of the body by some peculiar selective action of the particular infection.

The inter-relationship of gonorrheal infections of the prostate and seminal vesicles to arthritic manifestations is, of course, acknowledged by this medical body and nothing to support this view need be said.

It is a singular pleasure to realize that the conception of metastatic gonorrheal arthritis was first presented by one of our members; but it is to be regretted that we have been so tardy in appreciating what Dr. Fuller had repeatedly pointed out in this connection. It is with a sense of personal apology, in a way, that I take this opportunity to pay tribute to his teachings and to express my appreciation of them. It is not the intention of this paper to trace and explain the cycle of focal infection in the deep genital structures to metastatic manifestations, as such is clear to us all, nor to offer anything but histologic findings from material recovered at operations to prove that infections of the prostate and seminal vesicles usually exist together. It is furthermore unnecessary to point out that chronic infections of these structures may be the sole cause of a permanent urethral discharge. All these facts are understood and acknowledged

[1] Read before American Association of Genito-Urinary Surgeons, Atlantic City, June, 1919.

without question. The object of this paper is to present only *personal clinical and operative* experiences together with results and pathologic findings.

The selection of cases for seminal vesiculotomy should include those which have local or general manifestations dependent upon acute and chronic focal infections in these organs which cannot be overcome by the usual non-operative methods of treatment.

The pathologic classification consists solely of acute to chronic, non-tuberculous, grades of inflammation of the genital tract, beginning with the prostatic urethra and including the structures therein, the prostate, seminal vesicle, vas deferens, and epididymis, with the predominating feature of the inflammation located in the seminal vesicles and prostate. It is the retention of the products of inflammation in the seminal vesicles, and in some degree in the prostate, that results in the clinical symptoms, both local and general.

As infections in the prostate and seminal vesicles produce a somewhat varied clinical picture, they have been divided into four groups for consideration: (1) The inflammatory group, (2) the rheumatic or metastatic arthritic group, (3) the pain group, (4) the neurasthenic group.

1. The inflammatory group. Acute suppuration, occurring most often in the seminal vesicles and prostate in the course of acute urethritis, resulting in a febrile state and presenting locally a swollen, tender prostate and distended, painful seminal vesicles. This condition is generally treated by confinement to bed, local applications and drugs to relieve pain, with the result that after the acute process subsides there persists an urethral discharge from the sub-acute or chronic seminal vesiculitis and prostatitis, which may last for weeks or months, even with appropriate local treatment.

There is a group of patients that has come under my care with acute suppuration of the seminal vesicles, some with and some without abscess formation in the prostate. There have been some with an abscess in the prostate, seminal vesicles, and one epididymis, all true abscesses, from which frank pus has been

evacuated. Many of these patients presented the condition usually treated by local applications, hot rectal douches, rectal suppositories or other forms of sedatives, which, with the subsidence of the acute symptoms, lapse into the common picture of chronic seminal vesiculitis and prostatitis. In this group should be included patients admitted to the hospital with a diagnosis of ischio-rectal abscess, in whom there was no rectal disease, but a recent urethral infection; the true condition being a rupture of the seminal vesicle or prostatic abscess into the ischio-rectal fossa. Some of these cases showed no surface

FIG. 1. HIP JOINT. ACUTE INFECTIOUS ARTHRITIS OF GONORRHEAL ORIGIN

Shows absence of inter-articular cartilage, osseous proliferation along the edges of the acetabulum and some atrophy of the articular surface of the head of the femur.

changes on the buttock but rectal palpation revealed not only a swollen, painful prostate, but a tender indurated mass through the lateral wall of the rectum above the prostate. While some of these cases have revealed an abscess of the prostate which had ruptured into the ischio-rectal fossa, there has occasionally been true suppuration within the seminal vesicles as well. One patient had an abscess of many ounces originating in the right seminal

vesicle, which burrowed upward above the pelvic brim, nothing appearing on the buttock surface, and the prostate at operation showing no abscess formation. The group just mentioned, resembling ischio-rectal abscess in most respects, and being mistaken for such, even in the presence of the history of an urethral infection, and opened and drained in the usual manner of treating ischio-rectal abscesses, have as a sequence, in some instances, a fistulous tract leading to the diseased seminal vesicle, as proved by dissecting it to this structure.

FIG. 2. KNEE JOINT. ACUTE INFECTIOUS ARTHRITIS OF GONORRHEAL ORIGIN

Showing proliferation of synovia resulting in localized lips with a certain amount of osseous proliferation resulting in small spurs at the terminals of the joint surfaces; destruction of cartilage lessening the inter-osseous joint space.

I believe we shall come to realize that many so-called ischio-rectal abscesses are in reality ischio-prostatic or ischio-vesicle abscesses and that we should take advantage of early drainage of suppurative seminal vesiculitis as we do with prostatic sup-

puration. While most of the cases of this group may be cured by appropriate non-operative treatment, there are others which cannot be sufficiently drained through the natural channels which must be subjected to operative drainage of the seminal vesicles and prostate to effect a cure. There are cases of cystitis which can be explained in no other way than by the extension of the inflammation in the seminal vesicles to the bladder wall and mucosa.

2. Rheumatic group. Under this heading are included joint, tendon, muscle and bone lesions which may be dependent upon a focal infection. Gonorrheal seminal vesiculitis and prostatitis with metastatic lesions fall into the same class of focal infection as those arising from dental abscesses, tonsillar infections or other poorly drained infective foci, from which other parts of the body become secondarily invaded by emboli or toxins entering the blood stream. In searching for the focus which will explain a so-called rheumatic manifestation much differentiated study may be necessary in some cases; but in the differential diagnosis the condition of the prostate and seminal vesicles should be included.

3. Pain group. Under this heading are included those with persistent perineal pain, sometimes accentuated by defecation and often referred to the rectum. It is indefinite in character, but extremely disturbing to the individual, and is often associated with neurasthenic symptoms, painful erection, without sexual stimulus, frequent nocturnal emissions, sometimes painful, and bloody semen. This group usually gives a history of previous urethritis, and in the absence of rectal or bladder disease and the presence of palpable changes in the prostate and seminal vesicles, associated with abnormal elements in the fluid expressed from those organs, the cause of pain may be attributed to disease in these structures. Changes in the verumontanum may be associated with the changes in the prostate and seminal vesicles, and occasionally treatment of this structure alone may relieve the distressing symptoms.

4. Neurasthenic group. Under this heading are included those with but slight physical findings of disease in the seminal

vesicles as already enumerated and mental symptoms in the nature of depression, melancholia and apprehension, associated especially with sexual features; the so-called sexual neurasthena.

My clinical experience with patients falling into these four groups by non-operative and operative treatment not directed to the removal of the focus in the prostate and seminal vesicles has been discouraging.

There have been many cases in the *inflammatory group* which with acute suppuration in the prostate required drainage; but at the time the acute suppuration in the seminal vesicle was neglected and the subsequent condition was that of the usual chronic prostatitis and seminal vesiculitis case. The group of acute cases resembling ischio-rectal abscesses receiving simple incision and drainage frequently had persistent sinuses, some for long periods, and some required repeated operations and prolonged local treatment by massage, etc., and most were not cured.

The *chronic inflammatory group* had some patients who showed little or no improvement, and who vacillated from one doctor to another without resulting cure. The majority of the chronic group was made non-infectious, as far as could be determined, and in most of them the process became quiescent, some with, and some without remissions of symptoms. This latter group is still to be best treated by non-operative procedures, yet it is felt at present that the persistent cases had best be operated upon to remove the focus from which evidence of suppuration arises. In most of these classes the Belfield operation has proved of benefit, yet I believe there are some that cannot be cured by any procedure short of thorough drainage or removal of the seminal vesicles and a prostatotomy.

In the *rheumatic group* non-operative treatment, in the form of fixation, baking, local joint applications, massage, local urethral medication and irrigation, together with vaccines has been of benefit in the milder cases, yet a permanent cure has been rare. The opening and washing of joints added to the usual non-operative treatment has been occasionally beneficial, but on the whole the results have been poor and such treatment as opening the joints has now been discarded.

In the *pain group* and the *neurasthenic group* there has also seemed to me to be a predominating psychological element. Many have had prostatitis and seminal vesiculitis without a positive gonorrheal infection. Often there has been no history of the gonococcus infection nor could the gonococcus be found, but the abnormal amount of prostatic and seminal vesicle secretion persisted, and staphylococci and B. coli were not infrequently discovered in the secretions. The symptoms in these two groups may be dependent upon disturbances in the deep genital structures, yet most patients have had a queer mental attitude, especially in connection with sex relations; are often poor physical specimens and without physical employment or pleasures. It has been found that most of them suffered from constipation and other indefinite ailments which may be attributed to lack of physical pursuits and play a part in the general disturbances. This group has improved in my opinion, quite as much from a domineering personality and improved general perspective as from any non-operative or operative procedure, except in those patients where the deep genital structures gave evidence of a real inflammatory condition. In these latter patients, who number small in the group, some have been much improved and some may be considered cured by vesiculotomy or vesiculectomy and prostatotomy. On the whole these two groups have been subjected to operations reluctantly and only as a last resort with little expectancy of a cure in most.

My operative experience includes 194 patients; 52 in the inflammatory group, 128 in the rheumatic group, and 14 in the pain group. I have operated on none with neurasthenic symptoms alone, but most of the 14 patients in the pain group might be called neurasthenics, the only real symptoms being pain in the perineum, rectum or genitals, associated with pathologic findings in the prostate and vesicles, from which it was thought that the neurasthenic symptoms might arise. There has been no mortality.

Results. In the *inflammatory group* there are 52 cases; 17 of them were of the *acute variety*, 5 having suppuration of the prostate as well, and 4, besides showing pus in the seminal vesicles

and prostate, had a unilateral suppurative epididymitis. There were 5 other cases in which rupture of the seminal vesicle or prostatic suppuration had invaded the ischio-rectal fossa. There were 5 cases in which the suppuration was confined to the seminal vesicles.

Fifteen of these 17 cases can be considered cured, and all showed the immediate improvement incident to the evacuation of pus. With the establishment of drainage, pain was relieved, the temperature and leucocytosis dropped, and it remained only to care for the infection in the urethra. The course of these cases following suppuration in the seminal vesicles and prostate leads to the feeling that if such infection of these structures would go on to suppuration whereby all the foci of infection became confluent, a more rapid cure may be expected. Those cases in which the suppuration was in the seminal vesicles alone proved the hardest to cure, as the remaining foci of infection present in the prostate required further treatment, and in 2 patients the prostate continued to give some evidence of chronic infection for long periods.

Thirty-five of the 52 cases in the *inflammatory group* were of the *chronic variety*, having received local treatment over periods of months or years, the process being relatively quiescent at times, to be followed by acute exacerbations without known cause, or from obvious lowering of the local or general resistance. Vaccines which were employed in some of the cases proved of little or no value. The cases forming this group were subjected to operation only after it was evident that the inflammatory lesions could not be drained through the natural channels by the usual methods of non-operative treatment.

There were 6 patients in this group who had sinuses following a rupture of a suppurative seminal vesiculitis or prostatitis, each giving a history of having had an abscess develop during a gonorrhea and present on the buttock, which was incised. In one of these the sinus led to the seminal vesicle on one side, and in the other five it could not be determined that the sinus did not originate from the prostate. Each of these cases, however, had evidence of both seminal-vesiculitis and prostatitis.

Eighteen cases in this group required but little local treatment following operation to effect a cure and all may be considered greatly improved. In many, nearly all suppurative symptoms disappeared before the operative wound was healed and have had no further discharge. Especially is this true of the cases where the infection was chiefly in the seminal vesicles.

FIG. 3. FOOT. ACUTE INFECTIOUS ARTHRITIS OF GONORRHEAL ORIGIN

Showing slight osseous proliferation at metatarsal-phalangeal joints, especially the first; periosteal proliferation and erosion of cartilage in the tarso-phalangeal joints.

In the *rheumatic group* there were 128 cases. Many of these patients had been invalids, periodically, for many years. Some had monarticular affections, while others had multiple joint and tendon affections. Sixteen had so-called spurs of varying types on the under surface of the os calcis or other bones, and when present on the os calcis were bilateral, except in one patient.

Most of the cases had received nearly all known forms of treatment with varying benefit, but none had been cured. Accompanying urethral discharge, either acute or chronic, was the rule; and many who had become relatively free from rheumatic manifestations or apparently cured, were prone to a return of severe rheumatic symptoms most commonly following a new infection.

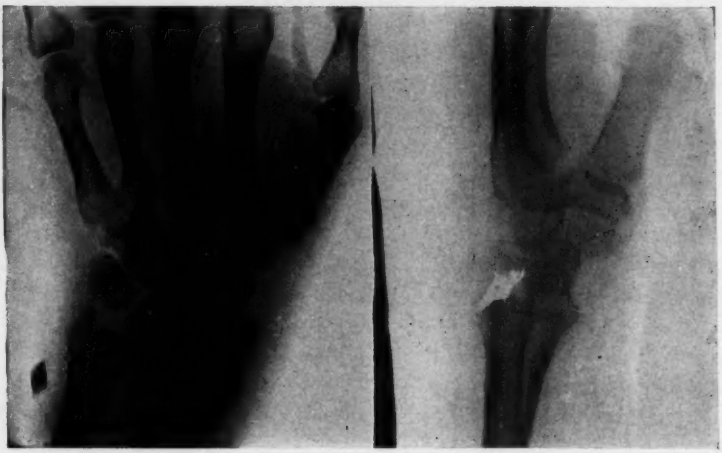


FIG. 4. WRIST JOINT. ACUTE INFECTIOUS ARTHRITIS OF GONORRHEAL ORIGIN

Shows a thinning of cartilage, particularly over the ulna; ulceration of the cartilage over the radius and atrophy of the end of the ulna and small bones adjacent to it.

Removal or drainage of the seminal vesicles and drainage of the prostate in this group has given the most striking results and this procedure has changed what was previously a most hopeless condition into one of the most satisfactory and brilliant surgical triumphs. Pain has disappeared from affected joints, following the ether recovery in most instances, and even large, swollen joints have often become normal in appearance within twenty-four to forty-eight hours following operation. While the explanation of this phenomenon is wanting, the facts remain,

and I believe it is the statements regarding this rapid relief from pain and astonishing subsidence of periarticular, and often the intra-articular swelling, that has been the cause of scepticism and the belief that such statements are over-enthusiastic on the part of those who have made them.

Periarticular swellings disappear much more rapidly than do those that are intra-articular, and when the intra-articular process has been of long standing, resulting in erosion of cartilage and atrophy of bone, considerable periods of time and appropriate accessory treatment are necessary to take care of such defects. With defects as shown in plate 1, where the articular cartilage of the head of the femur and acetabulum are destroyed, and as in plate 2 where the articular surfaces of the knee joint are diseased and associated with hyperplasia of bone, immobilization and subsequent passive motion had to be employed for long periods before repair and permanent improvement could be expected. In such cases, while great immediate improvement in pain and swelling was evident, these and joints with similar lesions approached a normal function only after many weeks and rarely have become absolutely normal joints. Destruction of cartilage with and without atrophy or hyperplasia of the small bones of the foot (plate 3) and wrist (plate 4) have been more satisfactory in their improvement than have the knee and hip joint affections.

When spurs have been present on the os calcis, they have been removed at the time of dealing with the seminal vesicles and prostate. There have been no recurrences of them. Periosteal changes occurring in long bones have not caused trouble and have been left. The few cases which have been observed following the seminal vesicle and prostate operation have shown that there has been no change in them, and I disagree therefore with those who maintain that periosteal changes dependent upon focal infection will disappear subsequent to the removal of the focus (Figs. 5, 6, 7).

Of the 128 cases in the *rheumatic group*, 18 had destructive intra-articular lesions. 16 had periosteal changes, mostly in the form of spurs on the os calcis, bilateral except in one. All

in the former group may be considered greatly improved, and most of them cured, the worst features being slight limitation in joint motion in those with destruction of bone and cartilage and weakness and some swelling in those with a villous arthritis all with periosteal spurs well cured by the removal of the spurs.

Of the 110 patients without destructive intra-articular lesions, all may be considered cured as far as joint manifestations are concerned.

Of the 128 patients, many had almost immediate subsidence of urethral discharge, yet most had the usual non-operative treatment for varying periods before the discharge disappeared. Especially was this true of the cases with active infection of long standing and those with stricture; and in a few, some discharge has remained more or less constantly. Vaccines have been employed more or less in about one-third of the patients, but those who have not received it have fared quite as well.

There are few cases in the *rheumatic group* that have returned with new gonorrheal infection, and but one who had anything resembling rheumatic manifestations in consequence. This patient was one in whom bilateral spurs were removed and who had bilateral flat feet. He had no joint swelling but considerable pain and tenderness about the ankles and in the back during the new active urethral discharge. Another patient of special interest was one who had the seminal vesicles removed but the prostate left untouched. There was much immediate improvement in the joints but there were exacerbations of signs and symptoms of a mild character off and on. One year and a half after the seminal vesiculectomy, I did a partial prostatectomy with a resulting cure, suggesting, at least, the possibility that a lesion of the prostate may be sufficient to produce the joint condition, which fact is borne out by our histologic study, lesions of the seminal vesicles and prostate often being found associated and sometimes being found in the prostate and not in the seminal vesicle tissue.

There is one patient not included in this series who presented such difficulties in the operation, from fibrous infiltration about the seminal vesicles, that they were not exposed or drained, the

prostate only being incised. This patient had been a helpless invalid for years, nearly every joint in the body being involved, so that he was unable to move or even feed himself. Although the seminal vesicles were not drained at operation, there was a temporary improvement, especially in the swellings of the knees and in regard to pain, but he soon relapsed into his former state. This patient died six months after operation.

In the *pain group* there are 14 cases. This group is the most unsatisfactory in regard to the results. The symptoms have been indefinite in character, associated with neurasthenic features, as mentioned under non-operative treatment. All means of alleviating the symptoms were employed before operation. Transitory improvement by different forms of treatment were not encouraging. All of the cases had evidence of chronic seminal vesiculitis or prostatitis. Nine of the fourteen had a discharge, and one had been proved sterile. In this case I had done a bilateral anastomosis of the vas deferens with the rete-testis for sterility three years previous to the operation on the seminal vesicles. In this case, as in all others of this class, there was an unusual amount of fibrous infiltration about the prostate and seminal vesicles, which, I believe, accounted for the pain. Four of the cases may be considered cured, three improved, and seven unimproved. All of the patients who had discharge were relieved of this feature, and all but one was relieved of pain. On the whole, this group of cases has been the most unsatisfactory of all.

The question as to the *comparative results of vesiculotomy and vesiculectomy* is one upon which I can make no statement from personal experience. In my early operations, while no attempt was made to remove the seminal vesicles unopened, the whole posterior wall was removed, the seminal vesicle tissue thoroughly destroyed, and the area swabbed with crude carbolic acid followed by alcohol, which resulted in a complete destruction of the organ, quite as effectually as its total removal. I am convinced, however, from the pathologic study of our tissue that any part of the seminal vesicle may be infected, and that as a general principle, every portion of it should be most thoroughly drained, destroyed or removed.

Regarding the *question of impotency* as a result of vesiculectomy or vesiculotomy, I have yet to see a case, except in the neurasthenic group, and in this series, some have been improved and some have remained the same. There have been several patients who for a few months after operation had had little sex desire and some who have complained that erection was poor at times, but in all the condition was considered psychical rather than physical, and I am convinced that impotency is not to be considered as a complication unless the patient is told that it will be so prior to operation, and possibly not even then.

Resulting *complications* attending the operation are: The opening of the rectum, bladder and peritoneal cavity, post-operative hemorrhage, and epididymitis. I have opened the rectum four times. In each instance it was immediately repaired; in two the repair was permanent. In one, the repair broke down and the fistulous tract was treated as an anal fistula with a satisfactory result. One had a fistula which has healed, opened and healed again, and has remained healed. I have opened the bladder once, which was immediately repaired and remained so, the bladder being drained by an indwelling catheter for several days. In the patient who had the peritoneal cavity opened, nothing was done to repair it and nothing resulted in consequence of it. There have been five cases of post-operative hemorrhage, which was controlled by pressure without opening and packing the wound, but some had a rectal packing made around a tube. There have been several cases of epididymitis, only, however, when the scrotum has not been supported. None of the cases of epididymitis has suppurated and all have been mild in character.

Pathology. The pathologic process as observed at operation, excluding the suppurative invasion of the ischio-rectal fossa, has varied from early inflammatory stages, where the infection is almost entirely confined to the seminal vesicles and prostate, to the late stages of the disease where there is marked chronic inflammatory infiltration of the tissue surrounding these structures, imbedding these organs in a dense mass of scar tissue, obliterating the normal lines of cleavage between the rectum and

the prostate and the base of the bladder, and so rendering the exposure of the seminal vesicles most difficult, and in two cases impossible. In the early stages of the disease, the prostate is

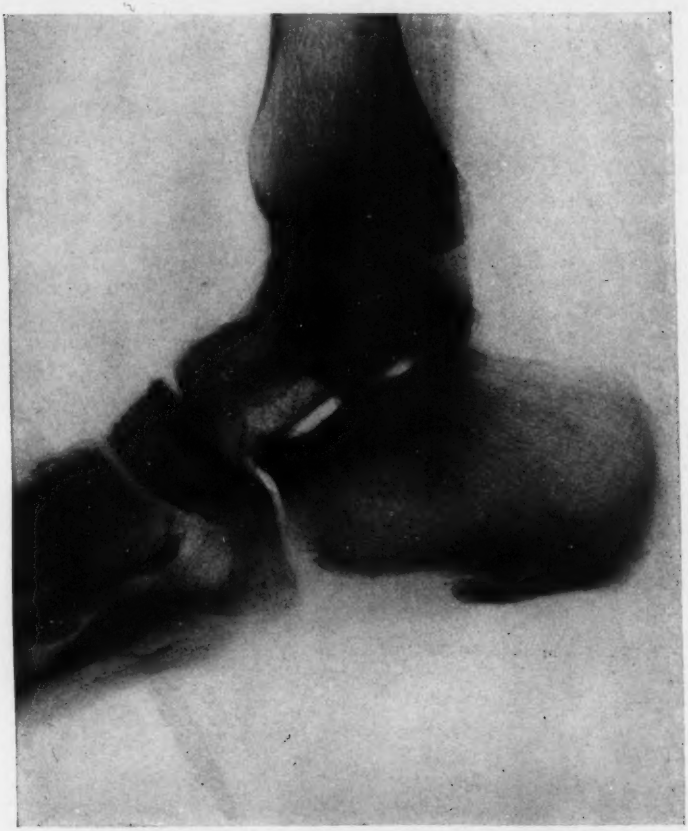


FIG. 5. FOOT. ACUTE INFECTIOUS PERIOSTITIS OF GONORRHEAL ORIGIN

Shows proliferation of the periostium and spur formation on the ventral surface of the os calcis.

found much swollen and boggy from congestion with blood and infiltration with lymph, and the seminal vesicles distended,

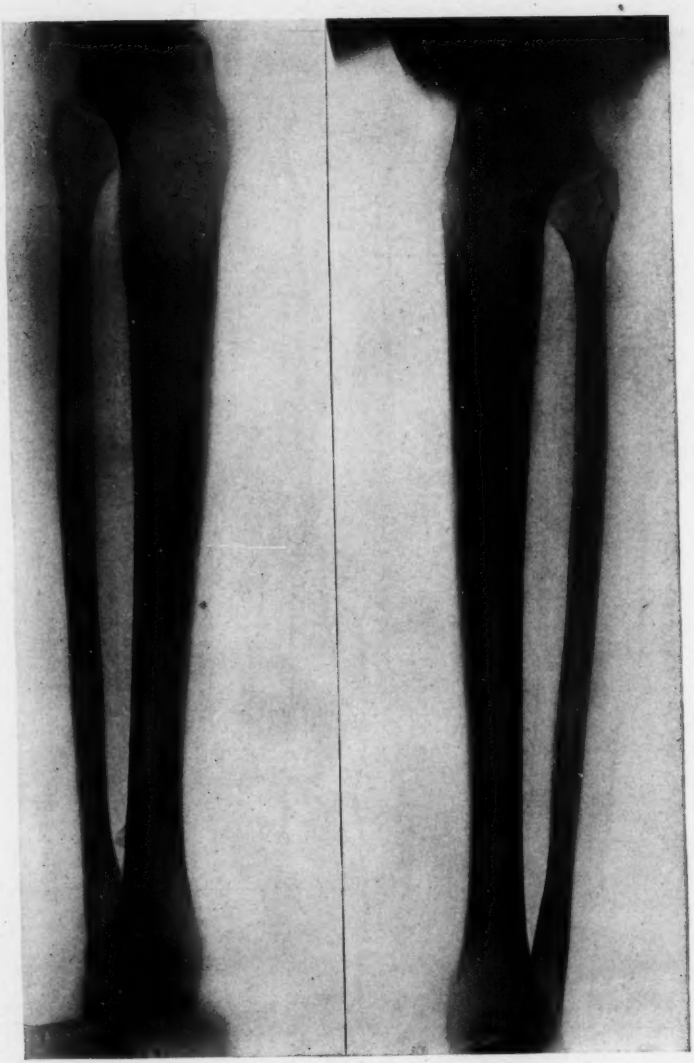


FIG. 6. TIBIA. ACUTE INFECTIOUS PERIOSTITIS OF GONORRHEAL ORIGIN

Shows a localized proliferation of periostium and bone formation on right tibia projecting towards the fibula.

fluctuant organs from the retained products of inflammation and secretion. When these structures have harbored infection over a long period of time, the tissues surrounding them, normally soft, are dense with induration and firmly adherent to the thickened walls of the seminal vesicles and rectum, and the prostatic capsule much thickened from infiltration by scar tissue. The organization of this plastic exudate surrounding the seminal vesicles and prostate may produce contraction of the ureter, which passes under the upper portion of the seminal vesicle, and extension of the inflammatory process may invade the bladder wall, producing a basal cystitis or trigonitis.

In many instances the infiltration of the fascial covering of the seminal vesicles was found so intimately bound to them that they could not be exposed; so that the seminal vesicle had to be opened through the thickened fascia. In the majority of instances, however, a total removal of the seminal vesicles has been successfully performed.

In a few instances, the seminal vesicles in an acute stage of inflammation have been freed from surrounding beds of inflammatory tissue, resembling the common condition of an acutely swollen and distended appendix imbedded in inflammatory tissue. It is this active acute process which, I believe, when left to become chronic, forms the group of cases so difficult for vesiculectomy.

The *vas deferens* has almost invariably participated in the inflammatory process, both acute and chronic, being intimately bound to the seminal vesicles, usually considerably enlarged, and with thickened walls and diminished lumen.

The *material contained within the seminal vesicles* has varied much in amount and character. In some the material has been small, in which instances the tubular structure has been observed as wide open, with thickened walls and a content quite fluid and but slightly cloudy. In some of the acute suppurative cases there has been frank pus, but in most, the material has been sero-gelatinous and opaque. In a few instances amalacious bodies have been found, and in only the acute suppurative type has the gonococcus been found.

For the purpose of *histologic and bacteriologic study*, a considerable amount of tissue has been collected at operation and subjected to various methods of investigation. A more detailed report of this work will form a future communication, written in conjunction with Dr. H. W. Cook, who has been conducting the pathologic study. The method of obtaining the tissue is as follows: In about 40 per cent of the cases only pieces of the seminal vesicles were removed, and in about 60 per cent the entire structure were excised. The prostatic tissue was obtained by splitting the capsule posteriorly over each lateral lobe and removing a generous section from each lateral lobe, and in some instances a considerable portion of one or both lobes. This tissue was immediately cultured and some dropped into Rosenow's culture fluid for bacteriologic study, and cultures taken from the seminal vesicle and prostate when these organs were first opened. The remaining seminal vesicle and prostate tissue was dropped into Zenker's fluid for histologic study.

Bacteriology. Briefly, it may be stated that the bacteriology is negative. Cultures and smears of the material found in the seminal vesicles at the time of operation have shown no growth of the gonococcus or litmus milk, hydrocele and blood agar, Rosenow's media and other culture media and with the exception of the gonococcus, which has been found in smears in some, but not all, of the early suppurative cases no organisms have been found that were not definitely contaminations.

The apparent absence of the gonococcus is not clearly understood, as this organism must be the original one producing the infection. It is generally appreciated that the gonococcus is not a virulent organism, and that its growth on culture medium is difficult, which may, in a measure, offer a sufficient explanation. These observations, in regard to the seminal vesicles, are exactly those in chronic gonorrheal tubes in the female.

Study conducted to find *organisms in the inflamed tissue* of the seminal vesicle and prostate has also proven negative.

Histology. It has been shown repeatedly in our study that pieces of a single seminal vesicle may show normal tissue and acute and chronic inflammation or any one of the conditions

alone; and that prostatic inflammation, in both the acute and chronic stages, has been found associated with inflammation in the seminal vesicle. It is evident from this study that the whole seminal vesicle is not always involved, and that the inflammation is usually confined to areas, which is likewise true of the prostate.

The grades of inflammation have varied, both in the seminal vesicle and prostatic tissue, from the most active acute to chronic types; both extreme types and intermediate grades have existed together in varying degree in each organ, and often together in both the prostatic and seminal vesicle tissue from one patient; and again the prostatic tissue may be little or not at all involved, while the seminal vesicle tissue from the same patient shows different stages of inflammation, and vice versa. In some patients one vesicle has been found infected and the other normal. This is the exception.

While the pathology and clinical evidence have not all been carefully correlated, enough has been done to impress one with the fact that the lesions seem quite insignificant as compared to the general symptoms and manifestations in many of the patients with arthritic disturbances. Especially is this true in view of the absence of organisms, both in culture and tissue, and as yet I have heard no convincing explanation of the almost miraculous subsidence of the symptoms and manifestations following the removal of foci, which, so far as we can determine are free from organisms and for that reason cannot be considered as virulent as the symptoms and manifestations suggest.

Technique of operation. Regarding this feature, nothing need be said in detail here, as the manner of exposing the prostate and seminal vesicle area is perfectly familiar. There are, however, a few features which have been helpful which I desire to mention. The first is the manner of fixing and holding the prostate while exposing the seminal vesicles. This, I think, is best accomplished by a fork tenaculum, and I have found it more convenient than stay-sutures or the tractor introduced into the bladder. The second is in regard to the exposure of the seminal vesicles, which I have found most easy of accom-

plishment by dividing the fascia of Denonvilliers along the superior border of the prostate and stripping it back as a whole, over the seminal vesicle area, rather than to excise it over each seminal vesicle. The next is in regard to delivering the seminal vesicle, which can be greatly aided by drawing downward on the vas deferens while one works around and behind the seminal vesicle with abruptly curved scissors. The next feature is in regard to replacing the rectum in its normal position and obliterating the area of operation and controlling any oozing by inserting a rubber tube covered with iodoform gauze, as a long plug, into the rectum as the final step in the operation. This also serves as a means of escape for gas during the period that the bowels are confined.

PLATE 1

SKIN FLAP DISSECTED AND RETRACTED DOWNWARD, EXPOSING BULB OF THE URETHRA AND THE MEDIAN PERINEAL TENDON

On either side of the median tendon the openings into the ischiorectal fossa are seen. Insert shows outline of skin incision.

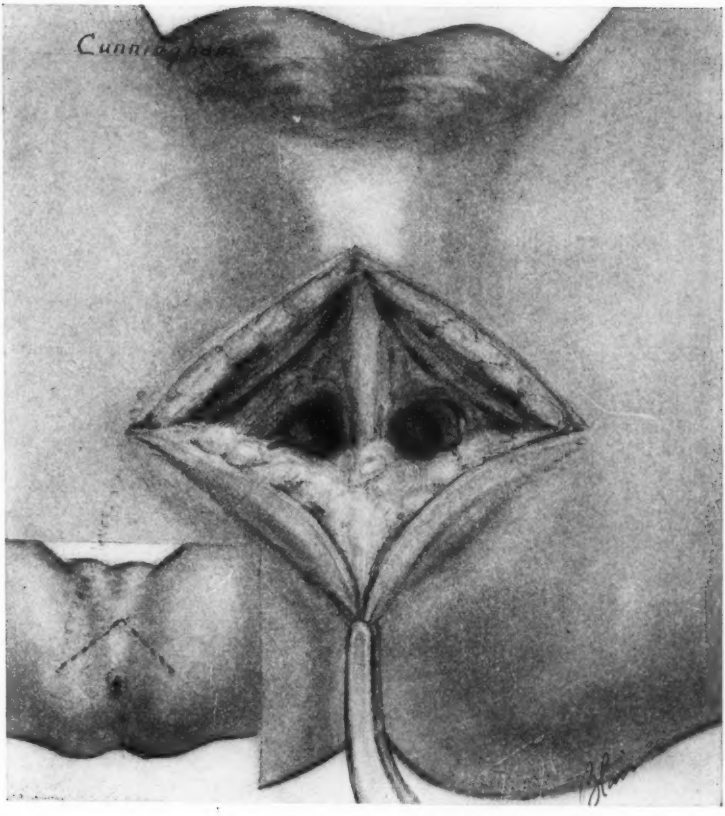


PLATE 2

INDEX AND SECOND FINGERS OF THE LEFT HAND INSERTED INTO THE FOSSAE, HOLDING THE RECTUM DOWNWARD, WHILE THE MEDIAN TENDON AND RECTO-URETHRALIS MUSCLE ARE DIVIDED

Dotted line on perineal tendon shows line of incision.

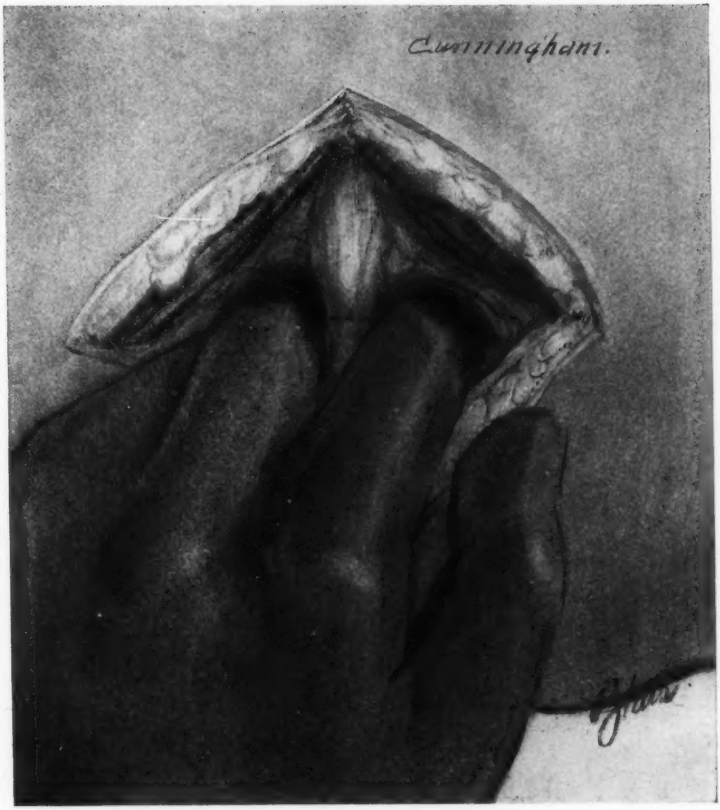

Cunningham.

PLATE 3

MEDIAN TENDON AND RECTO-URETHRALIS MUSCLE HELD FORWARD BY FINGER PRELIMINARY TO THEIR DIVISION

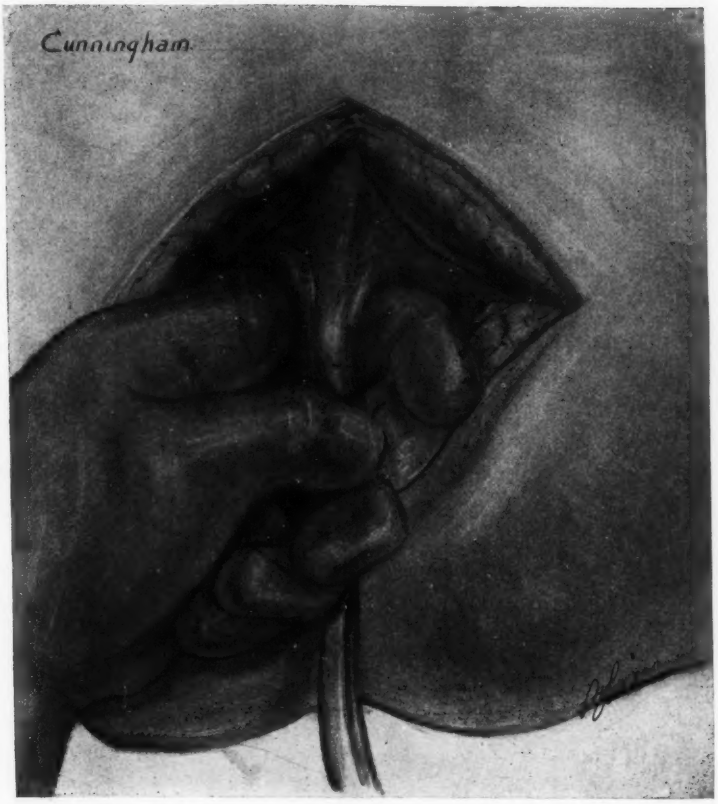

Cunningham

PLATE 4

Special Double Tenaculum Inserted Into the Prostate Just in Front of the Junction of the Prostate with the Bladder, Elevating the Prostate and Exposing the Seminal Vesicle Area

One seminal vesicle is seen showing through the fascia of Denonvilliers; and on the other side the fascia divided and retracted, exposing the seminal vesicle. The fascia may be divided along the dotted line, and wiped back exposing both seminal vesicles at the same time. At the bottom of the wound is the special retractor placed over the rectum.

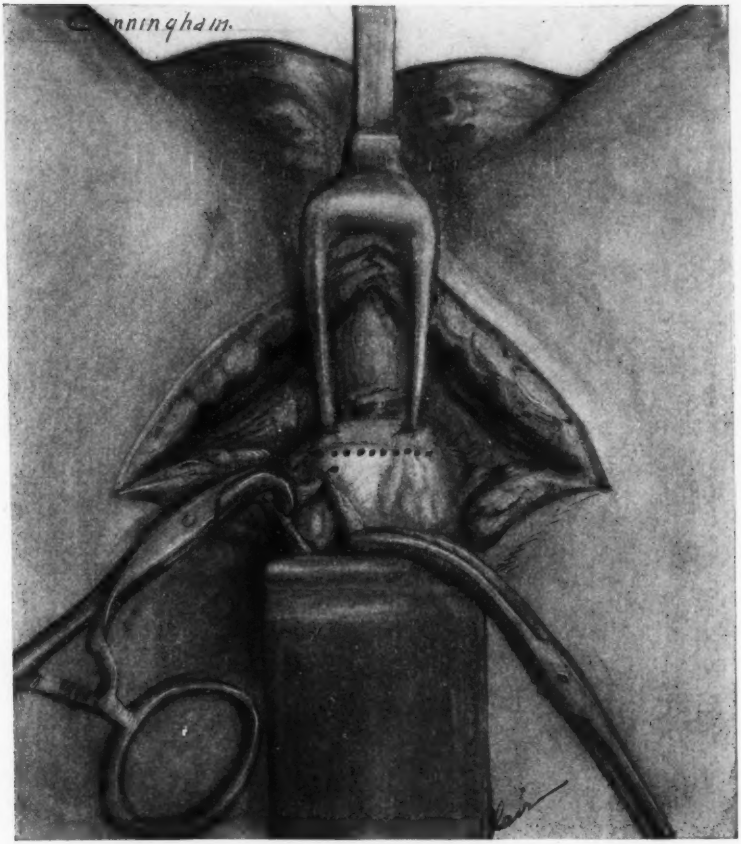


PLATE 5

Drainage Tubes Caught in the Structure of the Seminal Vesicles by a Catgut Suture and the Incisions into the Prostate Tissue

Both vasa deferentia are seen between the tubes. Insert shows in detail the opened ducts of the seminal vesicle with sutured tube in position, the opened vas deferens and the retracted fascia of Denonvilliers. If the seminal vesicles are removed the drainage tubes are sutured lightly to the vas at the highest point.

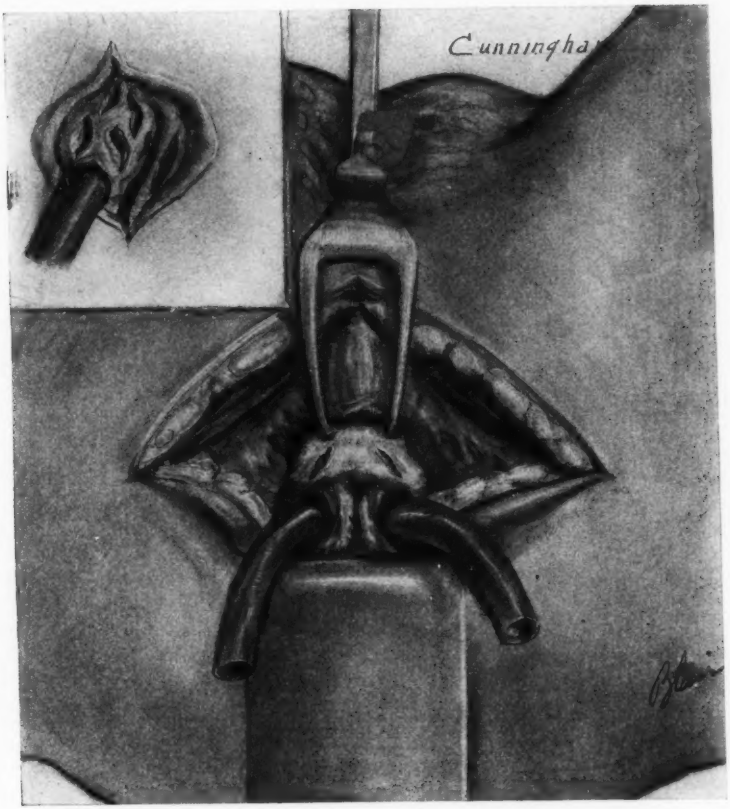
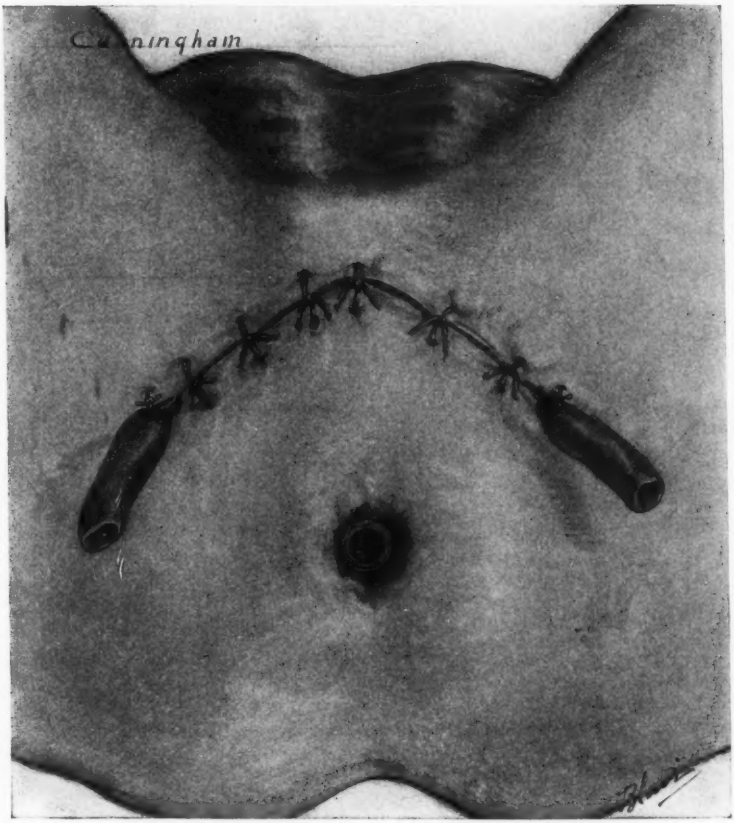

Cunningha

PLATE 6

WOUND CLOSED BY INTERRUPTED SILK WORM GUT SUTURES WITH DRAINAGE TUBES AT EITHER ANGLE OF THE WOUND, ALSO THE RECTAL PLUG MADE OF RUBBER TUBING AND GAUZE



LOCAL TREATMENTS FOR SEMINAL VESICULITIS WITH A DESCRIPTION OF SOME NEW METHODS

V. D. LESPINASSE

Chicago, Illinois

The treatment of seminal vesiculitis by injection through the vas deferens originated with Dr. Belfield. Since that time the only improvement on the original technic has been vaso puncture as advanced by Thomas. Knowing well the possibilities of this method of treatment, particularly in acute and sub-acute seminal vesiculitis, I have worked with it and wish to present to you today: first—some entirely new methods of manipulating the vas deferens so that medicaments can be injected through it into the seminal vesicles. Second—to show the results of some experimental work and prove that the choice of the medicaments injected into the vas deferens is a very important one and that no solution should be injected into the human vas deferens without preliminary experimentation.

The first technic I wish to present for your consideration has been named "the loop vas." In this technic the vas is exposed and freed for about 2 to 3 inches, pulled up out of the wound and the wound sutured, leaving the vas projecting from the wound as a loop. Next a Tiersch skin graft is cut and wrapped around the exposed vas in the same manner as a base-ball bat is taped. A piece of thin rubber or oiled silk is now laid over the wound and another folded over the vas. When healed, one has the vas covered with a thin layer of epithelium and projecting free from the scrotum. The results from this technic were disappointing as the layer of epithelium developing was much thicker than expected and consequently I do not recommend this operation for general clinical use.

The second technic is "intra-dermal transplantation of the vas." The vas is freed for an inch or so, brought out of the

FIG. 1. SCHEMATIC DRAWING SHOWING THE LOOP VAS OPERATION NEARLY COMPLETED

The vas is drawn out of the scrotum, the scrotal wound sewed and the vas is being wrapped with the first Thiersch graft.

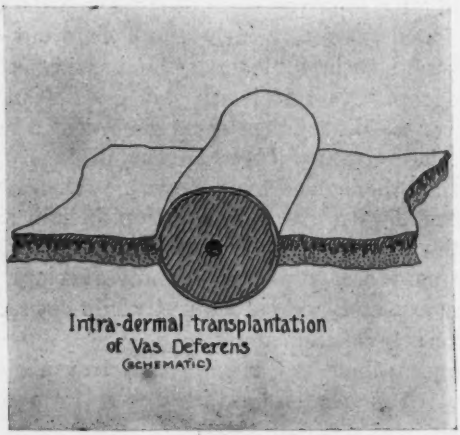


FIG. 2

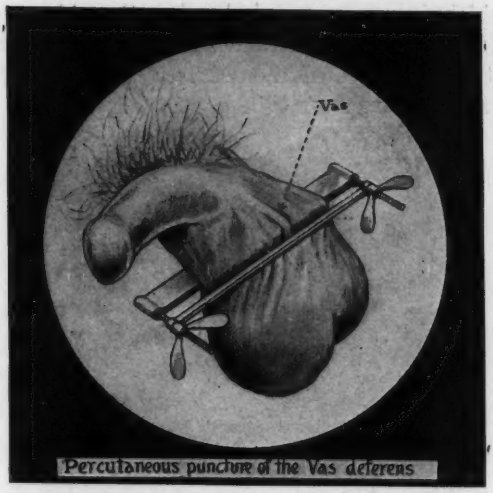


FIG. 3. SHOWS THE BIG CLAMP APPLIED TO SCROTUM AND TURNED SO THAT THE VAS APPEARS BENEATH THE SKIN AND IS HELD STEADY

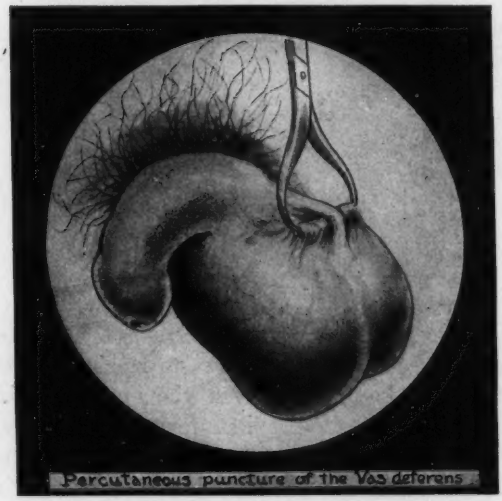


FIG. 4. SHOWS THE PUNCTURE CLAMP IN PLACE BENEATH THE VAS AND TRACTION MADE, BRINGING THE VAS UP DIRECTLY BENEATH THE SKIN

wound which is now sutured, leaving the skin edges slightly apart. The vas is now allowed to settle down into the space between the cut edges of the skin. Its center should be level with the skin surface. A thin layer of epithelium grows over

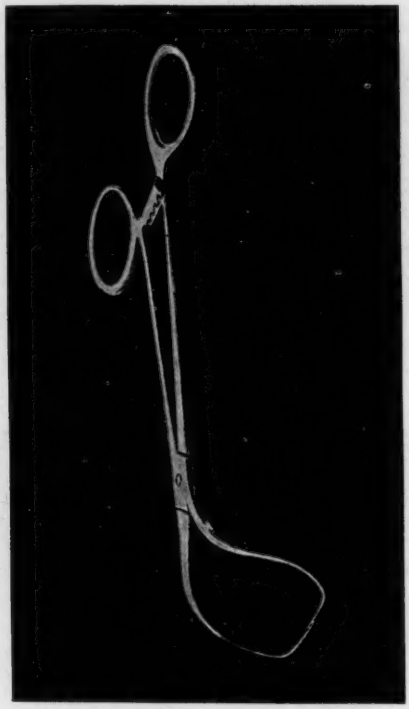


FIG. 5. SHOWS PUNCTURE CLAMP ITSELF

the exposed vas. As the vas is now superficial and fixed in the skin the lumen can be easily entered whenever desired.

Realizing that all of the previous technics require an incision and some dissection, and because of this are often refused by patients, we have worked out a technic that eliminates all cutting and dissection, a technic which is a real true office procedure.

To this technic we have given the name "percutaneous puncture of the vas deferens." To insert a needle into the lumen of the vas deferens without making a cut through the scrotal skin demands an exact technic. I submit for your consideration the different instruments by means of which I have performed this operation.

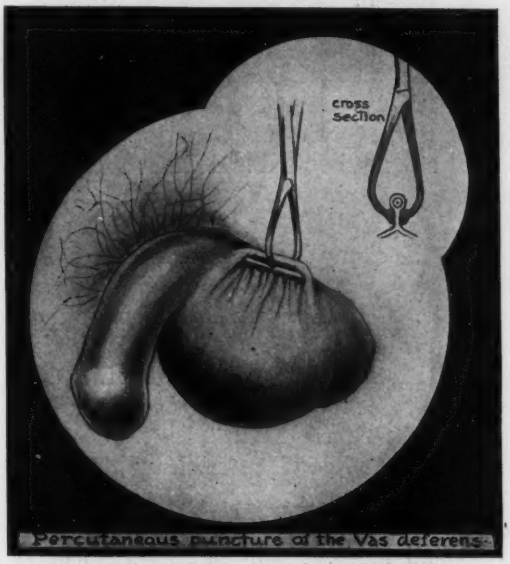


FIG. 6. SHOWS THE T CLAMP IN PLACE ON THE SCROTUM, PULLING THE VAS UP BENEATH THE SKIN AND THUS STABILIZING IT

The insert shows a cross section of the clamp, showing the relations of the scrotal skin and vas to the clamp.

1. Big clamp. To use this instrument the patient must have a long scrotum, otherwise one can not apply the clamp as the space between the testicles and the external ring is too short.

2. The puncture clamp can be used on the shortest of scroti. This instrument is an enlarged tenaculum whose teeth are at right angles to the sides of the loop of the instrument, also the teeth run by each other a goodly distance and thus make a rela-

tively straight rod. This instrument can be improvised with a large Hagedorn needle and two artery forceps.

The "T" clamp is a forceps with its two blades set at right angles to the shaft of the instrument. The shafts of the instrument are bellied out so as to allow room for the fold of scrotal skin with its contained vas.

TECHNIC

Big clamp. Note the distance from the top of the testicle to the attachment of the scrotum to the pubes. If this distance is slightly longer than the width of the clamp the big clamp can be used, if not, it can not be used and either the puncture clamp or "T" clamp can be employed.

The clamp is opened wide and the testicles passed through the opening. The clamp is now closed; when it is nearly closed the scrotum and the contained spermatic cord is spread out as much as possible. This manipulation identifies the vas and then the clamp is closed moderately tight. The clamp is now held steady by an assistant and a needle inserted into the lumen of the vas following the same technic as used in puncturing veins.

Puncture clamp. To use this instrument one first picks up the vas in as small a fold of skin as possible, pulling it away from the other structures of the cord. The clamp is now so placed that its points pass through the fold of skin beneath the vas.

Next the small mass of skin in the grasp of the clamp is stretched out so that the vas is made prominent. Some traction is made on the instrument and then one can insert the needle into the lumen of the vas.

"T" clamp. The vas is isolated in a fold of the scrotal skin the same as when we desire to use the puncture clamp. The clamp is applied loosely so as to replace the fingers. Next the skin is worked down through the clamp till the skin over the vas is tense, then the clamp is tightened, traction is made upward on the clamp and then the vas is ready to receive the needle.

Medicaments. An ideal medicament for injection into the vas into the infected vesicle should have the following properties:

non-corrosive to the epithelium of the vas, non-irritating to the mucosa of the vas and particularly non-irritating to the mucosa of the posterior urethra; solvent action on the secretions and exudates present, an anti-coagulant action to inhibit or prevent the normal coagulation of these secretions and lastly, a strong bac-

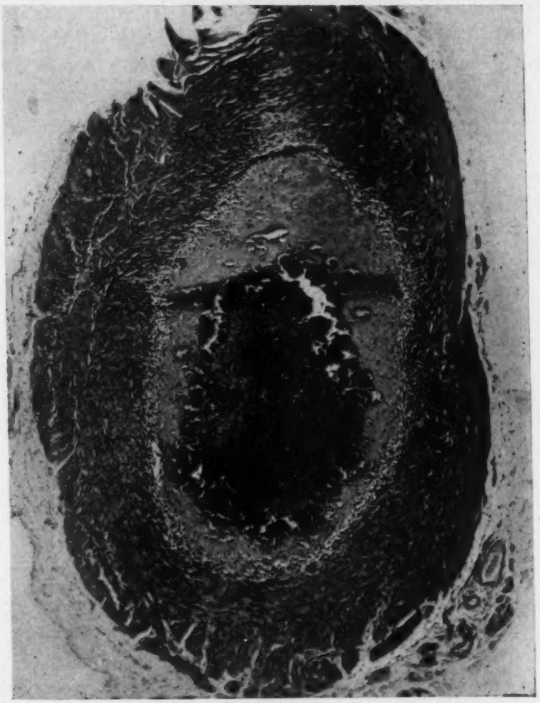


FIG. 7. SHOWS VAS AFTER INJECTION THROUGH ITS LUMEN OF SODA HYDRATE SOLUTION, SHOWING THE EXTREME NECROSIS AND DESTRUCTION DUE TO THIS INTENSELY IRRITATING SOLUTION

tericidal action. No one medicament answers all of these requirements, but the one making the closest approximation to the ideal is immune serum, the next collargol.

A solution injected into the vas deferens post-mortem flows into and fills the seminal vesicle before it discharges through the

ejaculatory duct. In life this is the sequence of events if the solution is non-irritant, but a markedly irritant injection thrown into the vas, such as 0.25 per cent soda hydrate solution will not enter the seminal vesicle at all, but will produce a spasm of the vesicle with immediate ejaculation of its contents. With solutions that are less irritating the spasm does not occur till after some of the fluid has penetrated into the vesicle duct and even into the vesicle itself.

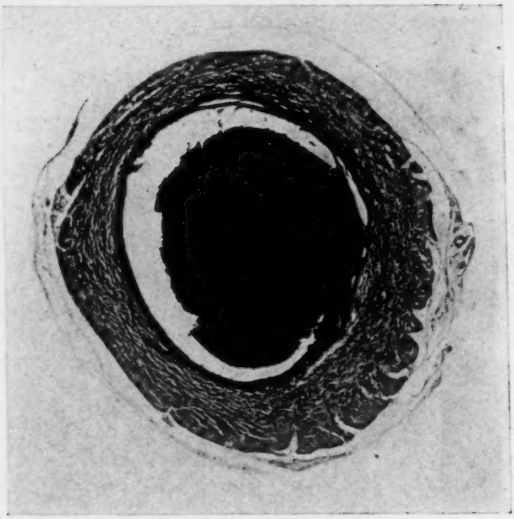


FIG. 8. CROSS SECTION OF THE VAS

Through whose lumen 10 per cent colargol solution had been injected ten days previously. Note the intense staining of the mucous membrane and the colargol mass still in the lumen of the vas.

The least irritating and the medicament that enters the vesicle the best is collargol in 10 per cent strength or less. This medicament invariably enters the vesicle and distends it to a maximum. One per cent soda bi-carbonate solution also enters the seminal vesicles well but it has only a solvent action on the vesicle secretions hence can do good only by improving the drainage

from the seminal vesicle. Five per cent sodium bicarbonate solutions destroy the epithelium of the vas but enter the vesicle well.

Acriflavine solution whose irritant action is delayed, enters the seminal vesicle fairly well, but in efficient antiseptic strength (1: 1000) it destroys the vas epithelium and consequently is not suitable for use.

Bactericidal serum has been used but little for therapeutic purposes because of its inefficiency. This is due to the great dilution of the serum by the body fluids when the serum is injected

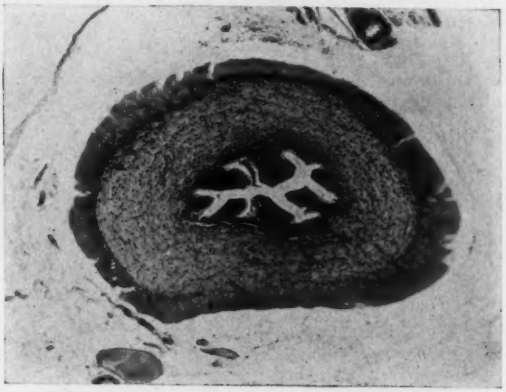


FIG. 9. CROSS SECTION OF THE VAS THROUGH WHOSE LUMEN 1 PER CENT SODA-BICARBONATE HAD BEEN INJECTED

Note that the epithelium is intact

subcutaneously. The only instance of therapeutic success in using a bactericidal serum is the treatment of epidemic meningitis with meningococci serum injected into the subarachnoid space. In this disease the serum is injected into a closed sac, the dura which also harbors the causative organism, absorption from this sac is very slow and consequently in epidemic meningitis the pathology and physical conditions for the action of a bactericidal serum are ideal; namely, non-dilution of the serum; prolonged contact with the bacteria both free in the cavity and in the wall

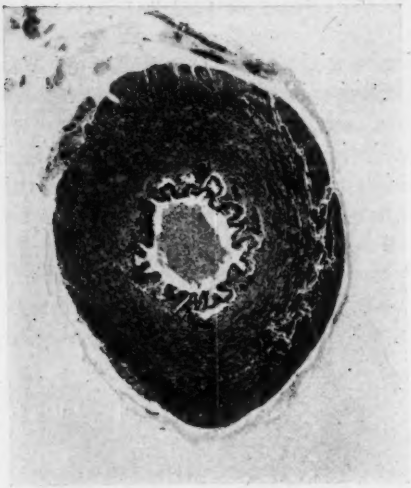


FIG. 10. CROSS SECTION OF THE VAS THROUGH WHOSE LUMEN 1–1000 ACRIFLAVIN SOLUTION HAD BEEN INJECTED, ONE HOUR BEFORE DEATH

Note that in a very few places the epithelium has been destroyed

FIG. 11. CROSS SECTION OF THE VAS INTO WHOSE LUMEN 1–1000 ACRIFLAVIN WAS INJECTED THREE DAYS PREVIOUSLY

Note complete destruction of the epithelium lining the vas

as the serum is absorbed. The same conditions to a great extent prevail in the seminal vesicles.

Bactericidal serum from the theoretical standpoint is the ideal antiseptic; from a practical standpoint its efficiency is high if its mode of action and conditions appropriate to this action are

FIG. 12. CROSS SECTION OF THE VAS INTO WHOSE LUMEN 1-1000 ACRIFLAVIN HAD BEEN INJECTED FIVE DAYS PREVIOUSLY

Note the almost complete destruction of the epithelium and obliteration of the vas lumen.

present or produced. For bactericidal serum to be effective complement must be present. In the clinical use of bactericidal serum complement is usually present in sufficient amount in the patients own serum. If the conditions necessitate, as they do

in the seminal vesicle, a surface action or a bactericidal effect upon the contents of the vesicle where the patients serum will not be available, one had best mix some fresh blood serum, either human or animal, with the immune serum at the time of injection.

FIG. 13. CROSS SECTION OF THE VAS THROUGH WHOSE LUMEN 1–1000 ACRIFLAVIN HAD BEEN INJECTED SEVEN DAYS BEFORE

Note almost complete destruction of the epithelium and obliteration of the lumen.

I have used bactericidal serum (antigonococcic) in the treatment of acute anterior urethritis, but the technics necessary to overcome the anatomical arrangement were so difficult that the attempt was given up.

In the treatment of chronic seminal vesiculitis however, I have used bactericidal serum, at first plain and later with the addition of fresh serum. Bactericidal serum can be injected into the seminal vesicle by any of the ordinary methods of vasostomy, but the field in which it is the antiseptic par excellence is when it is administered by my technic of percutaneous puncture of the vas. No solution that is irritating to the tissues can be used with this

FIG. 14. SEMINAL VESICLE CASTS DUE TO CHRONIC INFECTIONS EXPRESSED BY RECTAL MANIPULATIONS OF THE SEMINAL VESICLES

These casts are very common in chronic vesiculitis

technic as yet as it has not been developed to a point that we can be absolutely certain of entering the vas lumen. When the ordinary medicaments are used and we do not enter the vas lumen, one will have a marked tissue irritation in the structures surrounding the vas. With bactericidal serum if one does not enter the lumen of the vas, no pain or trouble will ensue as then we have simply given a subcutaneous dose of gonococcic serum.

Bactericidal serum is absolutely specific, hence if we expect to obtain results by its use, one must use the specific serum, for

whatever organism is present, or if we know or believe that multiple organisms are causing the infection, we must use a multiple serum. The bacteriology of acute seminal vesiculitis is probably gonococcic but the bacteriology of chronic seminal vesiculitis has not yet been worked out to an absolute end, but in all the published reports of examinations most of the common pus organisms are found and the gonococcus only in a minority of the cases. In fact many of the vesicles are sterile even when examined by grinding the vesicle wall in sand.

CONCLUSIONS

Puncture of the vas deferens and injection of fluids through it into the seminal vesicle is possible without cutting the skin. Acriflavine solutions in 1:1000 strength destroy the epithelium of the vas and hence can not be used.

Sodium bicarbonate solution in 1 per cent strength is proper and safe. In 5 per cent solution it is destructive to the epithelium of the vas. The only medicament that can be used safely by means of percutaneous puncture of the vas is bactericidal serum.

DISCUSSION

Dr. W. F. Braasch, Rochester, Minn.: I would like to ask Dr. Cunningham whether he noticed any tendency to recurrence of symptoms at any time following the vesiculotomy.

Dr. J. D. Barney, Boston, Mass.: I listened with a great deal of interest to Dr. Cunningham's presentation of a very good piece of work. We did a considerable series of these cases, and I studied them pretty carefully before and after, together with a lot of autopsy specimens. We found that a great many cases which improved very encouragingly, after operation, and continued to improve, finally relapsed, and after a little further search of these cases we found they had other foci, which we were not keen enough to have discovered beforehand, namely, various sinuses of the face and head, and after the removal of the focus, whatever it was, these cases got well and stayed so. We followed them very carefully for a number of years.

In regard to impotency, I had one case of distinct and well marked impotency continuing for many months. This patient was a peppery sort of a man, of considerable vigor sexually, and he came in complaining bitterly. He got quite nasty about it, and I was a little bit worried, but I kept on reassuring him, without having much ground on which to do it, and finally things came around all right, to the extent that only a year or so ago he called me up to say that he had been hailed into Court for getting some girl into trouble.

It is interesting to note that in the removal of these vesicles, which is difficult on account of the adhesions, in one case, at least, of which I know, and from whom I removed both vesicles, the continuity of the vas was not destroyed. This was a doctor, who has since married, and has become a father.

I agree with Dr. Cunningham about the necessity of removing or destroying all of the seminal vesicle tissue. A considerable

series of cases of autopsy specimens which I injected and studied pretty carefully showed that there are little accessory vesicles, as you might call them, attached to the main vesicle by a very narrow and tortuous canal, which is not appreciated at operation in many cases. We studied carefully our cases from a bacteriological standpoint, and we were able to find no bacteria whatever.

I would like to ask Dr. Cunningham how long his cases have been followed up. A question similar to Dr. Braasch's. We got very good results soon after operation, but we were very much disappointed in the ultimate results, which means, if we followed them up for a year, or five years after operation, many of them recurred.

Dr. JOHN H. CUNNINGHAM, Boston, Mass. (closing): In response to these questions I will have to ask a question myself, to answer Dr. Braasch, and this also, will be the main point brought out by Dr. Barney. I want to know to which group of cases you refer; do you refer to the rheumatic group?

Dr. BRAASCH: Rheumatic group.

Dr. CUNNINGHAM: We have had no relapse of symptoms, except in the one patient I speak of. This patient who had bilateral flat feet, acquired a new gonorrheal urethritis, and in him there was some muscular disturbance. Whether or not it could have been attributed to the new gonorrheal infection I do not know.

Dr. BRAASCH: There were over one hundred patients, were there not, in that group?

Dr. CUNNINGHAM: That group contains 128 patients. I can answer Dr. Barney's question at this time in regard to how long the cases have been followed. I really cannot say when I did my first case, but I think it was either five or six years ago.

I have been especially interested in these cases in regard to what the end results may be, and at the Long Island Hospital,

which is a poor-house, and where our patients are very apt to remain over long periods of time, and if discharged from the hospital return there, we have been able to follow most of them over very long periods of time. The City Hospital cases are more difficult to keep a check on. As the patients have been discharged from the hospital I have requested them to come to my office for the after care, which the hospital authorities agreed to; and in that way I have been able to keep track of the most intelligent of them over a considerable period, having them report to me every three months, and, of course, while some of them do not do it, the majority of them have. There is no doubt that I would hear from the private cases if everything were not satisfactory.

In regard to cases that show less improvement than we might hope for, other foci must be looked for; but I think that in the differential diagnosis of these cases, prior to the operation, every feature should be thoroughly gone into, particularly the tonsils. Less often the lesions are found in the teeth, and sinuses, and prostate. I think that a great many gentlemen who have been doing this operation have neglected the prostate, and I am positive myself that the prostatic lesions are so commonly associated with lesions in the vesicles, that the prostate must not be left untouched in doing this operation. You must include the prostatic drainage with the vesicle drainage.

In regard to fertility, I have not known of any of my patients impregnating, following this operation. I feel most of these cases are sterile before we do the operation, on account of the inflammation in the genital tract, particularly the vesicles and vas, and I have always told them that they would never be able to beget their kind, and as yet I know of none that have.

I recall some experimental work that I did some years ago in removal of seminal vesicles from dogs, rabbits and guinea-pigs, in which we have every reason to believe that they begot their kind.